

INSTRUCTION MANUAL

TRANSMISSION
MEASURING SET
MODEL 305A

PRELIMINARY

PROPERTY OF ENGINEERING
TOOL EQUIPMENT
CROSBY, D.Y. OF AYCO

ITEM 1 COPY 1

PHILCO



PHILCO-FORD CORPORATION
Sierra Electronic Operation
Menlo Park, Calif. • 94025

**TRANSMISSION MEASURING SET
MODEL 305A**

101-200

PRELIMINARY

A02530500A

Price \$15.00

October 1967

PROPERTY OF ENGINEERING
TEST EQUIPMENT
CROSLEY, DIV. OF AVCO
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MODEL 305A

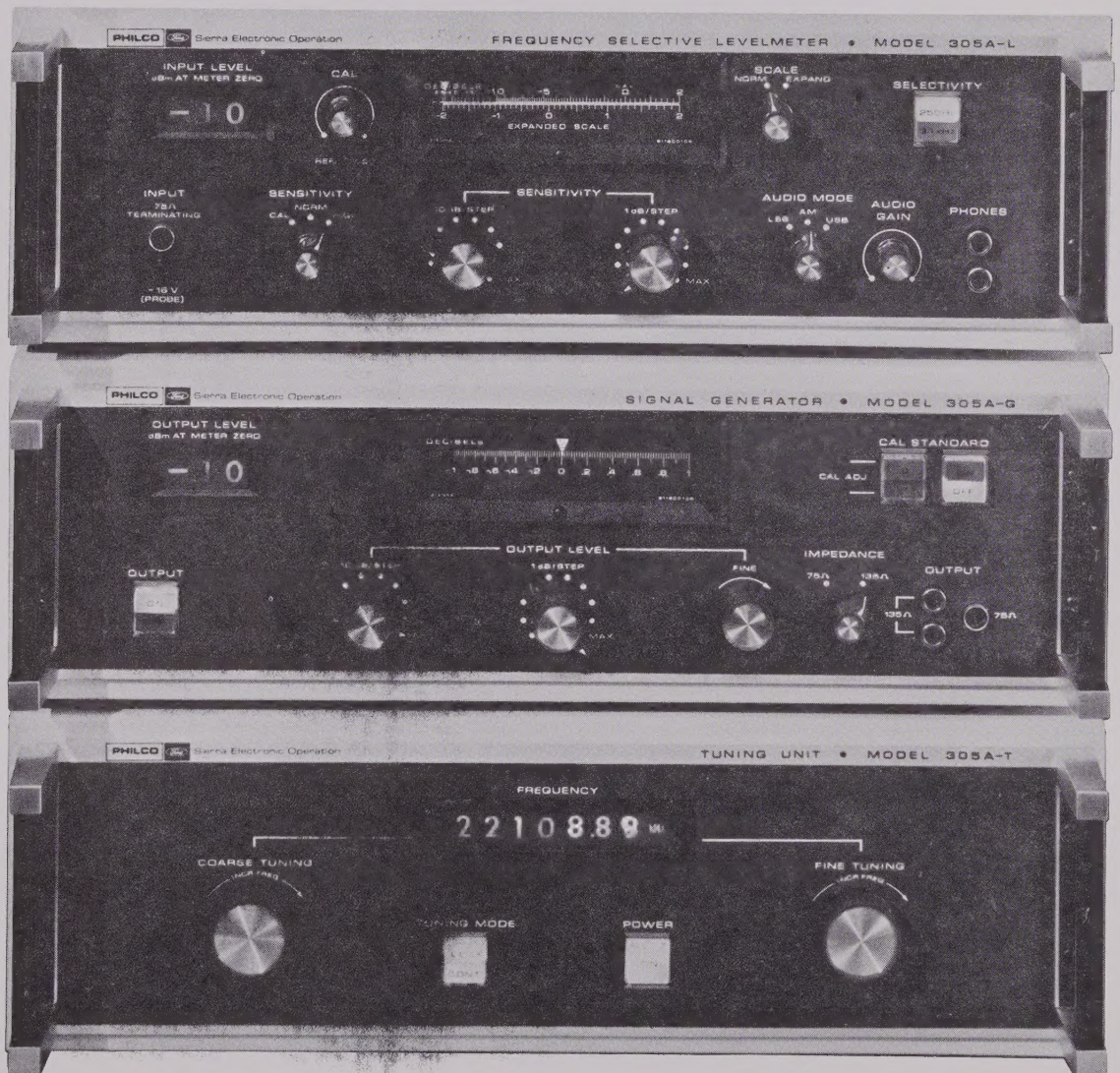


Figure 1-1. Model 305A Transmission Measuring Set

SECTION I

GENERAL

A. OVERALL PURPOSE

The Model 305A Transmission Measuring Set (See Figure 1-1) is designed to measure signal levels and responses on high-density transmission systems. The set may also be used as a conventional signal generator. Model 360A Spectrum Display Unit may be used in conjunction with the Model 305A to display high-density frequency spectra.

The Model 305A Transmission Measuring Set is an all-solid-state, three-module equipment. The three modules are the Model 305A-T Tuning Unit, the Model 305A-L Frequency Selective Level Meter, and the Model 305A-G Tracking Signal Generator. The level meter and the signal generator may be used separately, but the tuning unit must be used with each. When the level meter is used with the signal generator, only one tuning unit is required. (See Figure 1-2 for an over-all block diagram.)

B. MODEL 305A-T TUNING UNIT

1. Purpose

The Model 305A-T Tuning Unit tunes the level meter to a selected frequency and controls the frequency of the signal produced by the signal generator. It may also tune the Model 360A Spectrum Display Unit to the frequency of interest.

2. Description

The tuning unit may be tuned either continuously or frequency-locked every 100 kHz. Frequency lock is indicated by a relay-operated panel lamp. Both aural (relay click) and visual (panel lamp) indications of the locked condition are thus furnished. See Figure 3-1 through 3-4 for views of the Tuning Unit. A fine-tuning oscillator furnishes incremental frequencies between the 100 kHz lock points.

The tuning unit provides extreme frequency accuracy through the use of oven controlled, crystal-referenced, phase-locked tuning systems and a frequency counter.

The counting and switching circuits automatically sum the coarse tuning and fine tuning frequencies to a certainty and accuracy of the actual tuned frequency, plus or minus 15 Hz (maximum). These circuits also relieve the operator of most of the calculations normally required to interpret the instrument.

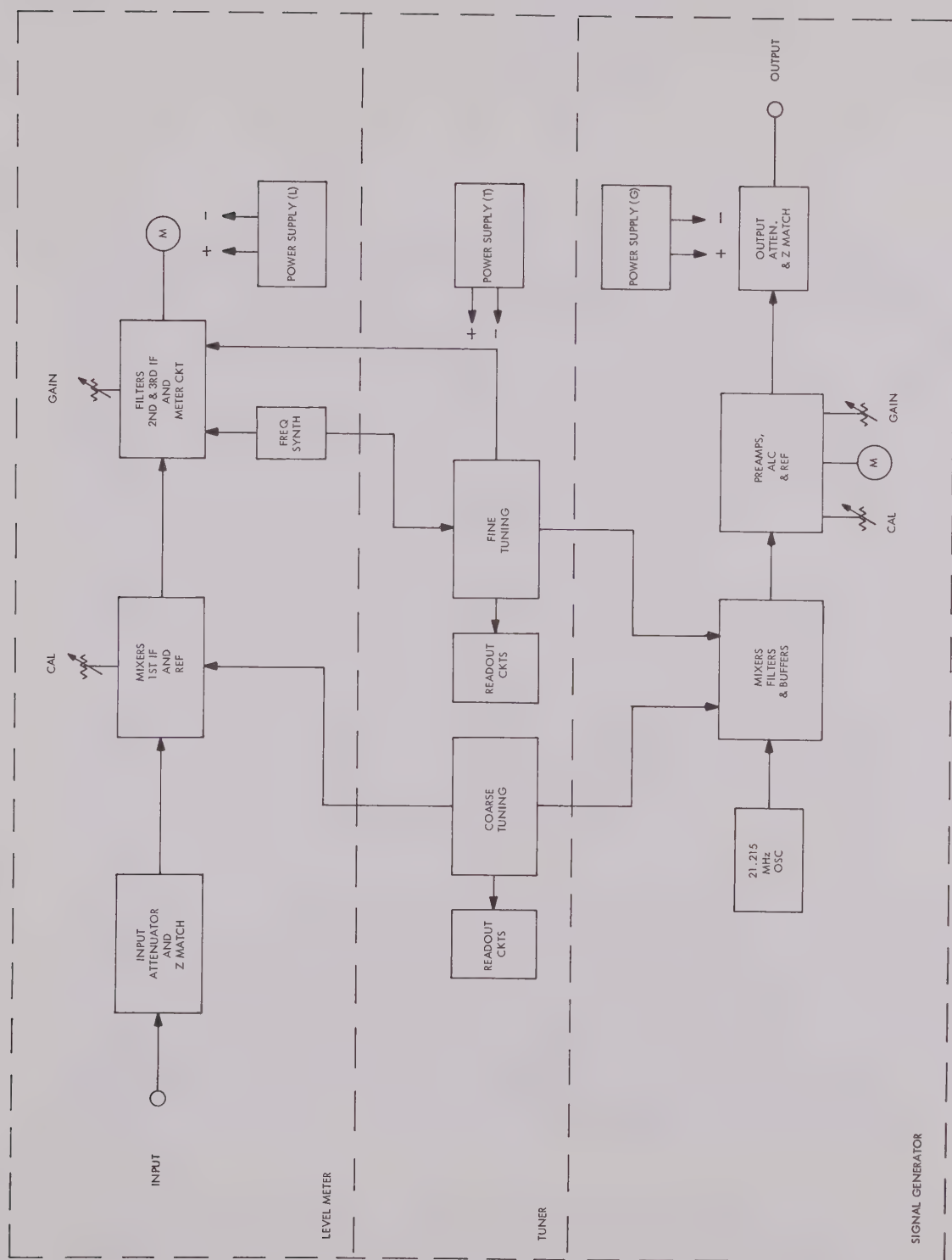


Figure 1-2. Transmission Measuring Set Block Diagram

The unit displays the sum of the coarse tuning and the fine tuning frequencies on a rear-projection type digital display. This display features a wide viewing angle and a complete lack of parallax. This display illuminates only the three most-significant figures in the CONT Mode, but illuminates all seven figures when locked in the LOCK Mode. In the CONT Mode, MHz and the correctly placed decimal point illuminates and, when locked in the LOCK Mode, kHz illuminates. The decimal place moves to its correct position. When FINE TUNING Control is adjusted outside of its normal 100 kHz range, kHz HIGH or kHz LOW (as applicable) lights.

The tuning unit contains a frequency synthesizer, coarse-tuning system, fine-tuning system, a frequency counter and a display system. See Figure 6-1 for a block diagram of these systems.

3. Specifications

ELECTRICAL SPECIFICATIONS

Output Frequencies

Coarse Tuning		40.1 to 73.6 MHz
Accuracy		Clock Accuracy
Stability		Clock Stability
Fine Tuning		18.775 to 18.895 MHz
Accuracy		$\pm(10 \text{ Hz} \pm \text{Clock Accuracy})$
Stability		$\pm(2 \text{ Hz}/^{\circ}\text{C} \pm \text{Clock Stability})$

Clock Accuracy

(Referred to output freq. above)		$\pm(\text{Setting Accuracy} \pm \text{Stability})$
Setting Accuracy		$\pm 2 \text{ parts in } 10^7$

Clock Stability

Variation with temperature		
($+15^{\circ}\text{C}$ to $+40^{\circ}\text{C}$)		$\pm 5 \text{ parts in } 10^9/^{\circ}\text{C}$
Aging rate (Per Week after		
30 days)		$\pm 1.5 \text{ parts in } 10^7$
Variation with Line Voltage		
($\pm 10\%$)		$\pm 7.5 \text{ parts in } 10^8$

ELECTRICAL SPECIFICATIONS (Continued)

Warmup Time

Operational (with clock on Standby 24 hr. prior) . . .	30 min.
Clock	24 hr.
Standby Condition	Main Switch "Off" Line cord plugged in 115/230V outlet

Frequency Readout

Indicated Readout Frequency Range	
Locked Mode	0 to 33500.00 kHz
Minimum Reading Increment	10 Hz
Continuous Mode	0 to 33.5 MHz
Minimum Reading Increment	0.1 MHz

Temperature Range	15°C to 40°C
-----------------------------	--------------

Output Level

Coarse Tuning Output	
Model 305A-L	125 mV rms $\pm$ 10 mV
Variation over the Frequency Range	40 mV maximum
Model 305A-G	230 mV rms $\pm$ 30 mV
Variation over the Frequency Range	40 mV maximum
Load Impedance	50 ohms

Fine Tuning Output	
Model 305A-L	240 mV rms $\pm$ 30 mV
Model 305A-G	240 mV rms $\pm$ 30 mV
Model 305B	90 mV rms $\pm$ 20 mV
Load Impedance	50 ohms

19.0 MHz Output	
Model 305A-L	95 mV rms $\pm$ 20 mV
Load Impedance	50 ohms

Input Power Requirements	115/230V $\pm$ 10%, 47/63 Hz
Model 305A-T	110VA

MECHANICAL SPECIFICATIONS

Overall Size

Rack Mount

Width	19 inches
Height	5-1/4 inches
Depth (Behind Panel).	17 inches
(Handles protrude 2-1/8 inches)	
Weight	30 lbs.

Cabinet Mount

Width	20-1/4 inches
Height	6-1/2 inches
Depth	21-5/8 inches
Weight	45 lbs.

C. MODEL 305A-L FREQUENCY-SELECTIVE LEVEL METER

1. Purpose

The Model 305A-L level meter measures the level of radio-frequency signals within the range of 10 kHz to 33.5 MHz. It measures signals with level from minus 109 dBm to plus 22 dBm. This equipment may be used to measure signal or carrier levels, harmonics, cross talk, or interfering signals in communication systems or equipment. See Figure 3-30 through 3-33 for views of the equipment. See Figure 6-2 for block diagram.

2. Description

The level meter receives analog coarse tuning and fine tuning frequencies, plus a stable intermediate frequency from the tuning unit, and heterodynes a monitored signal against these three frequencies. As the tuning unit tunes through its range, the panel meter peaks at the frequency of the monitored signal. The input signal may then be attenuated in 1 dB and 10 dB steps to bring the panel meter into its most accurate area.

After the frequency of the monitored signal is roughly determined, the band-pass characteristics of the meter may be narrowed, thus ensuring a highly accurate level measurement. By narrowing the band-pass and by increasing the sensitivity of the panel meter, level measurements may be made as closely as 0.1 dB.

The meter allows the operator to monitor audio frequency signals on a carrier. The level meter also provides a 21.1 MHz reference signal for the Model 360A Spectrum Display Unit, when used.

The level meter consists of an attenuator and low-pass filter section, a first IF section, a second IF section, a third IF section, band select section, a meter section, and an audio section.

3. Specifications

The following performance specifications for the Model 305A-L Frequency Selective Level Meter apply when it is used in combination with the Model 305A-T Tuning Unit.

FREQUENCY

Range	1 kHz to 33.5 MHz
Coarse Tuning (Phase Locked 100 kHz Steps or Continuously Tuned)	0 to 33.5 MHz
Accuracy of Readout (Referenced to Tuned Frequency)	$\pm (A \pm B \pm C)$
(A) Filter Center Freq. Tolerance . .	± 50 Hz
(B) Counter Uncertainty	± 10 Hz = ± 1 count
(C) Clock Accuracy	$\pm (D \pm E)$
(D) Setting Accuracy	$\pm (0.40 + 2 \text{ parts in } 10^7)$ Hz
(E) Stability	$\pm (F \pm G \pm H)$
(F) Variation with Temp (15°C to 40°C)	$\pm (0.25 + 1.25 \text{ parts in } 10^7)$ Hz
(G) Variation with Line Voltage ($\pm 10\%$)	$\pm (0.15 + 0.75 \text{ parts in } 10^7)$ Hz
(H) Aging (Per Week after 30 days)	$\pm 0.30 + 15 \text{ parts in } 10^7$ Hz
Stability (Referenced to Tuned Frequency)	$\pm (X \pm Y)$
(X) Fine Tuning System Stability (15°C to 40°C)	± 50 Hz
(Y) Clock Stability	Section E

Level

Measurement Range	-109 to +22 dBm (-89 to +22 dBm Full Scale)
-----------------------------	--

Normal

(Low Sensitivity)

(1 kHz to 32.1 MHz) -89 to +22 dBm

High Sensitivity

(60 kHz to 32.1 MHz)

(20 dB Gain Increase) -109 to +2 dBm

Meter Range

(Relative to Input Level Indicator)

Normal Scale -25 dB to +2 dB

Expanded Scale -2 dB to +2 dB
(0.1 dB per division)

Measurement Accuracy

At Reference CAL Freq. of

1 MHz and 0 dBm ± 0.2 dB

Frequency Response

Fine Tuning

(Entire Range) ± 0.1 dB

Course Tuning

(Relative to 1 MHz)

60 kHz to 22 MHz ± 0.2 dB0 to 32 MHz ± 0.5 dB

Attenuator Accuracy

10 dB per Step Attenuator

1 kHz to 22 MHz . . . ± 0.2 dB1 kHz to 32 MHz . . . ± 0.3 dB

1 dB per Step Attenuator

1 kHz to 32 MHz . . . ± 0.1 dB

INPUT IMPEDANCE

Impedance 75 ohms, unbalanced

Return Loss

Max. CW Attenuator Position. 26 dB minimum

Other Attenuator Positions . . 30 dB minimum

Connector Type		
Normal		WE477B on Panel
Optional		WE477B on rear of chassis
Other Impedances		 With probe accessories

SELECTIVITY

Wideband Crystal Filter		
3 dB Points		3.1 $\pm$ 0.2 kHz
60 dB Points		8.0 $\pm$ 0.5-1.0 kHz
Narrowband Crystal Filter		
3 dB Points		205 $\pm$ 50 Hz
60 dB Points		1000 $\pm$ 100 Hz

SPURIOUS RESPONSES

Image Frequency Rejection		
Tuned f	22 MHz (80 to 102 MHz) . .	70 dB minimum
Tuned f	22 MHz (102 to 112 MHz) . .	60 dB minimum
IF Rejection		75 dB minimum
Residual Distortion Attenuation (High Sensitivity)		
Input f	60 kHz	55 dB minimum
Input f	60 to 200 kHz	65 dB minimum
Input f	200 kHz	75 dB minimum

OUTPUTS

Audio

Detection		
Amplitude Modulation		AM Detector
Single Sideband		Carrier Reinsertion
Sensitivity		
Normal		Same as meter selectivity
Optional		Wide band. Independent of meter selectivity
Output		Phones (600 ohms min. impedance)
Connector		Dual telephone jack

Level Recorder

Output Current		0 to 200 μ A thru load impedance
Load Impedance		1200 ohms maximum
Connector		Single telephone jack

Spectrum Display (Model 360B)

Frequency		21.11 to 20.99 MHz
Impedance		50 ohms
Connector		BNC female

TEMPERATURE RANGE 15°C to 40°C

INPUT POWER

Voltage		115/230VAC $\pm$ 10%
Frequency		47 to 63 Hz
Volt Amperes		25 VA

OVERALL SIZE

Cabinet Mount

Width		20-1/4 inches
Height		6-1/2 inches
Depth		19-1/4 inches

Rack Mount

Width		19 inches
Height		5-1/4 inches
Depth	(Behind Panel)	15-3/4 inches
	(Handles protrude 2-1/8 inches)	

WEIGHT

Cabinet Mount		35 pounds
Rack Mount		22 pounds

D. MODEL 305A-G TRACKING SIGNAL GENERATOR

1. Purpose

The Model 305A-G Tracking Signal Generator when used with the Model 305A-T Tuning Unit, produces a signal that is tunable from 1 kHz to 32 MHz. The signal level may be controlled from -90 dBm to +1 dBm output impedances of 75 or 135 ohms are switch selected. (See Figures 3-47 to 3-50 for views of this equipment.)

2. Description

The Model 305A-G Tracking Signal Generator produces a 1 kHz to 33.5 MHz signal at minus 80 to plus 1 dBm. The generator receives the coarse tuning and fine tuning analog signals from the tuning unit and uses these signals to control the output frequency. See Figure 6-2 for the block diagram.

Two attenuators, one in 1 dB steps and the other in 10 dB steps control the output level. A digital power meter and auxiliary analog power meter indicate the output power.

The signal generator includes a built-in precision DC/AC transfer standard which is used to monitor the output level.

Output impedances of 75 or 135 ohms are switch-selected. The signal generator consists of a first mixer stage, a second mixer stage, an automatic level control, a power amplifier, a dc reference standard, an impedance-matching network and an attenuator display section.

3. Specification

FREQUENCY

Range	1 kHz to 33.5 MHz
Range at 75 ohms Impedance . . .	1 kHz to 33.5 MHz
Range at 135 ohms Impedance . . .	10 kHz to 3.0 MHz
Coarse Tuning	0 to 32 MHz
(Phase Locked 100 kHz Steps or Continuously Tuned)	
Fine Tuning	-10 kHz to +110 kHz
(Relative to Coarse Tuning Setting)	

Accuracy of Readout (Referred to Tuned Frequency)	
Generator Model (305A-G/305A-T)	$\pm(B \pm C_T \pm C_G \pm D)$
(B) Counter Uncertainty	$\pm 1 \text{ Count} = \pm 10 \text{ Hz}$
(C _T) Clock Accuracy (305A-T)	$\pm E_T$
(E _T) Stability.	$\pm (F_T \pm G_T \pm H_T)$
(F _T) Variation with Temp. (15°C to 40°C)	$\pm (2.625 \pm 1.25 \text{ parts in } 10^7) \text{ Hz}$
(G _T) Variation with Line Voltage ($\pm 10\%$)	$\pm (1.575 \text{ to } 0.75 \text{ parts in } 10^7) \text{ Hz}$
(H _T) Aging (Per Week After 30 days)	$\pm (3.150 \pm 1.5 \text{ parts in } 10^7) \text{ Hz}$
(C _G) Clock Accuracy (305A-G)	$\pm E_G$
(E _G) Stability	$(\pm F_G \pm G_G \pm H_G)$
(F _G) Variation with Temp. (15°C to 40°C)	$\pm 3.150 \text{ Hz}$
(G _G) Variation with Line Voltage ($\pm 10\%$)	$\pm 2.100 \text{ Hz}$
(H _G) Aging (Per Week after 30 days)	$\pm 16.800 \text{ Hz}$
(D) Combined Setting Accuracy (Both Clocks)	$\pm 2 \text{ parts in } 10^7 \text{ Hz}$
Tracking Model (305A-G/305A-L/305A/T)	$\pm (A \pm B \pm C_T \pm C_G = D)$
(A) Filter (305A-L) Center Freq. Tolerance	$\pm 50 \text{ Hz}$

Stability $\pm (X \pm Y \pm Z)$
(Referenced to Tuned Frequency)

(X) Fine Tuning System Stability
(15°C to 40°C) ± 50 Hz

(Y) Clock (305A-T) Stability E_T

(Z) Clock (305A-G) Stability E_G

LEVEL

Range (All Impedances) -90 dBm to +1 dBm

Meter Range (Relative to Output Level Indicator) -1 dB to +1 dB
(0.02 dB per division)

Tracking Error 0.05 dB

Accuracy

CAL STANDARD at 0 dBm ± 0.1 dB

Frequency Response

Unbalanced Output (75 Ω)

1 kHz to 22 MHz ± 0.1 dB

1 kHz to 32 MHz ± 0.2 dB

Balanced Output (135 Ω)

10 kHz to 3 MHz ± 0.2 dB

Attenuator Accuracy

10 dB per Step Attenuator

1 kHz to 22 MHz ± 0.2 dB

1 kHz to 32 MHz ± 0.3 dB

1 dB per Step Attenuator

1 kHz to 32 MHz ± 0.1 dB

SPURIOUS OUTPUTS

Harmonic Distortion	
Unbalanced Output	
1 kHz to 22 MHz	40 dB below fundamental
22 kHz to 32 MHz	34 dB below fundamental
Balanced Outputs (10 kHz to 3 MHz) . . .	40 dB below fundamental
Spurious Signals	50 dB below fundamental

OUTPUT IMPEDANCE

Unbalanced	75 ohms
Connector (Normal)	WE477B on panel
(Optional)	WE477B on rear of chassis
Balanced	135 Ω
Connector	WE410A on panel

TEMPERATURE RANGE	15°C to 40°C
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INPUT POWER

Voltage	115/230VAC $\pm 10\%$
Frequency	47 to 63 Hz
Volt Amperes	50 VA

OVERALL SIZE

Cabinet Mount	
Width	20-1/4 inches
Height	6-1/2 inches
Depth	19-1/4 inches
Rack Mount	
Width	19 inches
Height	5-1/4 inches
Depth (Behind Panel)	14-3/4 inches
(Handles protrude 2-1/8 inches)	

WEIGHT

Cabinet Mount	38 pounds
Rack Mount	25 pounds

E. MODEL 305A TRANSMISSION MEASURING SET

1. Purpose

All three units are used together (See Figure 1-1) to make frequency runs on communications systems and equipment. In this configuration, the tuning unit synchronously tunes the signal generator and the level meter. In so doing, the signal generator outputs the frequency to which the level meter is tuned. By inserting this signal into a communications system, a transmission line or filter, and monitoring the output with the level meter, a frequency response curve can be drawn.

SECTION II

OPERATION

A. SCOPE

This section describes the operation of Model 305A Transmission Measuring Set. The section is separated into three further subsections, one subsection on each configuration in which the Model 305A is usually connected.

Each subsection is separated into Controls and Indicators, Preparation for Use, and Operating Procedure paragraphs.

B. FREQUENCY - SELECTIVE LEVEL METER

This subsection describes the use of the Model 305A-L Frequency-Selective Level Meter in conjunction with the Model 305A-T Tuning Unit.

1. Controls and Indicators

Tables 2-1 and 2-2 list and describe the controls and indicators on the Model 305A-T Tuning Unit. Tables 2-3 and 2-4 list and describe the controls and indicators on the Model 305A-L Frequency-Selective Level Meter.

TABLE 2-1 TUNING UNIT FRONT PANEL CONTROLS AND INDICATORS

Control Indicator	Description	Schematic Ref.
COARSE TUNING Control	Coarse Adjustment Main Tuning	C1
FINE TUNING Control	Fine Adjustment Main Tuning	C2
TUNING MODE Switch	Push button switch Selects LOCK (green) or CONT (white) tuning mode	S2
FREQUENCY Display	Back-lighted Digital Frequency Display Indicates Tuned Frequency.	DS1
POWER Switch	Push button switch. Lites green when ON.	S1

TABLE 2-2 TUNING UNIT BACK, PANEL CONTROLS AND INDICATORS

Control Indicator	Description	Schematic Ref.
EXT-INT Switch	Selects external or internal clock.	S3

TABLE 2-3 FREQUENCY SELECTIVE LEVEL METER FRONT PANEL CONTROLS AND INDICATORS

Control Indicator	Description	Schematic Ref.
INPUT LEVEL Indicator	Indicates Setting of SENSITIVITY Switch	DS1
CAL Control	Positions Panel Meter Indicator	R3
SENSITIVITY Switch	Selects CAL or NORM or HIGH Sensitivity	S3
SENSITIVITY Switches	Two rotary switches attenuate input in 1 dB and 10 dB increments	S1-S2
AUDIO MODE Switch	Selects Lower Sideband, Amplitude Modulation, or Upper Sideband Audio Mode	S4
AUDIO GAIN Control	Adjusts Audio Amplitude	R4
REF OSC Control	Screwdriver adjustment adjusts panel meter Expanded Scale to agree with Normal Scale	R1
SCALE Switch	Selects NORM or EXPAND Scale of Meter	S6
SELECTIVITY Switch	Push button Switch Selects NB (white) or WB (green).	S5
DECIBELS Meter	Indicates modification of INPUT LEVEL Indicator reading.	M1

TABLE 2-4 FREQUENCY SELECTIVE LEVEL METER BACK PANEL CONTROLS AND INDICATORS

Control or Indicator	Description	Schematic Ref.
LINE SELECTOR Switch	Allows level meter to operate on 115 or 230V ac	S3

2. Preparation For Use

To prepare the level meter for use, proceed as follows

- a. Verify that LINE SELECTOR Switch on both the tuning unit and the level meter are in the proper position for the expected line voltage.
- b. Install a power cord from plug P23 on the level meter to Jack J2 on the tuning unit, connect the coarse tuning, the fine tuning, and the intermediate frequency output jacks on the tuning unit to similar jacks on the level meter, and terminate the unused coarse tuning and fine tuning outputs with the terminating caps furnished.
- c. Visually inspect both instruments for signs of damage.
- d. Install the tuning unit power cord into a source of line voltage.
- e. Wait three hours for temperature stabilization.

3. Operating Procedure

To operate the level meter, proceed as follows:

- a. Set SCALE Switch on the level meter to NORMAL Position.
- b. Push POWER Switch on the tuning unit.
- c. Verify the following conditions:

POWER Switch	Lit red
TUNING MODE Switch	Lit either green or white
FREQUENCY Meter	Lit
SELECTIVITY Switch	Lit either green or white
INPUT LEVEL Meter	Lit
DECIBELS Meter	Lit

- d. Operate SELECTIVITY Switch to the WB (green) condition.
- e. Set SENSITIVITY Switch to CAL Position.
- f. Operate TUNING MODE Switch to the LOCK State, and tune the tuning unit to 1 MHz.
- g. Adjust FINE TUNING Control for maximum indication on the level meter.
- h. Adjust CAL Control for a 0 dB indication on the level meter.
- i. With a 75 ohm coaxial cable, connect the unknown signal to the INPUT Jack.
- j. Operate TUNING MODE switch to CONT condition.
- k. Tune COARSE TUNING Control through its range, observing the level meter for a peak indication.
- l. When a peak is detected, operate TUNING MODE switch to the LOCK condition.
- m. Increase attenuators to bring the peak on scale.
- n. Operate SELECTIVITY Switch to the NB Condition.
- o. Tune FINE TUNING Control for a maximum indication on the level meter.
- p. Increase attenuators to bring the peak within 1 dB of a 0 dB indication.
- q. Set SCALE Switch to the EXPAND position.
- r. Tune FINE TUNING Control for a maximum indication.
- s. To determine the level, add the indications on the INPUT LEVEL Indicator and the panel meter.
- t. Monitor the signal under test for noise or cross talk as follows:
 - (1) Install 600 ohm (minimum) earphones in PHONES Jack with AUDIO GAIN Control fully counterclockwise.

- (2) Set AUDIO MODE Switch to LSB position.
- (3) Carefully turn AUDIO GAIN control clockwise, and listen through the earphones until a noise is heard.
- (4) Disconnect the input cable. Compare the two sounds. If the sound does not change, there is no noise on the carrier frequency.
- (5) Successively set AUDIO MODE Switch to AM and USB position and repeat steps (2), (3) and (4).

C. TRACKING SIGNAL GENERATOR

This subsection describes the operation of the Model 305A-T Tracking Signal Generator in conjunction with the Model 305A-T Tuning Unit.

1. Controls and Indicators. Tables 2-1 and 2-2 describe the controls and indicators on the tuning unit. Tables 2-5 and 2-6 describe the controls and indicators on the signal generator.

TABLE 2-5 TRACKING SIGNAL GENERATOR FRONT PANEL CONTROLS AND INDICATORS

Control or Indicator	Description	Schematic Ref.
OUTPUT LEVEL Indicator	Indicates setting of OUTPUT LEVEL switches	DS1
OUTPUT	Push button switch. Lights green when ON. Lights red when OFF.	S1
OUTPUT LEVEL Switches and Control	Two switches and one control adjust output attenuators	S1, S3 and R3
IMPEDANCE	Matches impedance of output	S1
CAL STANDARD 0- +1 Switch	Push button switch lights red when energized. Applies internal reference to M1	S2
CAL STANDARD ON-OFF Switch	Push button switch lights red when ON and green when OFF	S1

TABLE 2-5 TRACKING SIGNAL GENERATOR FRONT PANEL CONTROLS AND INDICATORS (Continued)

Control or Indicator	Description	Schematic Ref.
DECIBELS METER	Indicates the decibels to be added to or subtracted from the indication of the OUTPUT LEVEL display	M1
CAL ADJ 0 dB	Screwdriver adjustments. Calibrates M1 at 0 dB	R5
CAL ADJ +1 dB	Screwdriver adjustment. Calibrates M1 at +1 dB	R4
115V ac - 230V ac	Allows tracking generator to operate on 115 volt or 230 volt current	S3

2. Preparation For Use

To prepare the tracking signal generator for use, proceed as follows:

- a. Carefully inspect the tuning unit for damage.
- b. Verify that LINE SELECTOR Switches on both units are in the correct position for the line voltage.
- c. Plug the power cord of the signal generator into Jack J3 of the tuning unit, connect the coarse tuning and fine tuning output jacks of the tuning unit to similar input jacks on the signal generator, and install the furnished terminating caps on the outputs to the meter, then wait three hours for temperature stabilization.
- d. Operate the OUTPUT Switch of the signal generator to the OFF condition.
- e. Operate the POWER Switch on the tuning unit to the ON condition.
- f. Operate the CAL STANDARD ON-OFF switch to the ON condition.
- g. Operate the CAL STANDARD 0 dB - +1 dB switch to the 0 dB condition.
- h. With a screwdriver, adjust Calibrate Adjust -0 dB potentiometer, R5, for 0 dB indication on the DECIBELS meter.

- i. Operate the CAL STANDARD 0 dB - +1 dB Switch to the +1 dB condition.
- j. With a screwdriver, adjust Calibrate Adjust - +1 dB, potentiometer, R4, for a +1 dB indication on the DECIBELS meter.
- k. Operate the CAL STANDARD ON-OFF switch to the OFF condition.
- l. Operate the OUTPUT Switch to the ON condition.
- m. Set the OUTPUT LEVEL switches to 0 indication on the OUTPUT LEVEL indicator.
- n. Adjust OUTPUT LEVEL - FINE potentiometer for a 0 dB indication on the DECIBELS meter.
- o. Set IMPEDANCE Switch to the correct position.
- p. Set the OUTPUT LEVEL Switches and control to the desired level. The output level is the sum of the indication on the OUTPUT LEVEL indicator and the DECIBEL meter.
- q. Operate the TRACKING MODE Switch to the LOCK position.
- r. Adjust COARSE TUNING and FINE TUNING controls for the desired frequency, then operate TRACKING MODE Switch to TRACK condition.
- s. Operate OUTPUT Switch to the ON condition.

D. TRANSMISSION MEASURING SET

Most commonly, the level meter will be operated in conjunction with the signal generator. This combination makes it possible to study response curves, band-pass curves, and attenuation curves. Provision is made for attaching a recorder to the output of the level meter so that a permanent record of the signal level may be made. When operating all three units together, no terminating caps should be installed.

SECTION III

THEORY OF OPERATION

A. SCOPE

This section discusses the functional analysis and the circuit descriptions of the three modules that make up the Model 305A Transmission Measuring Set. Each module will be discussed separately.

B. TUNING UNIT

The Model 305A-T Tuning Unit furnishes the reference frequencies to the Model 305A-G Tracking Signal Generator, and the Model 305A-L Frequency Selective Level Meter and an IF signal to the level meter. The unit may also send a reference signal to the Spectrum Analyzer, Model 360A. See Figures 3-1 through 3-4 for view of the Tuning Unit. See Figure 6-1 for the block diagram.

1. Functional Analysis

The following paragraphs discuss the functional analysis of the tuning unit.

a. Frequency Synthesizer Section

This section sends a 100 kHz, 1.6 volt, peak-to-peak square wave to the Counter Section and to the Coarse Tuning Section, a 19.0 MHz, 0.24 volt, peak-to-peak sinewave to the Fine Tuning Section, and a 19.0 MHz, 95 milli-volt, rms sinewave to the Frequency Selective Level Meter for use as an intermediate frequency.

The Frequency Synthesizer Section usually employs an oven-controlled 1 MHz crystal oscillator for a frequency, but may utilize an external frequency standard in lieu thereof.

b. Coarse Tuning Section

The Coarse Tuning Section uses a very stable Colpitts type oscillator to tune desired frequencies in 100 kHz increments. The section locks onto these frequencies by applying error voltages to a voltage-variable semiconductor capacitor known as a varactor.

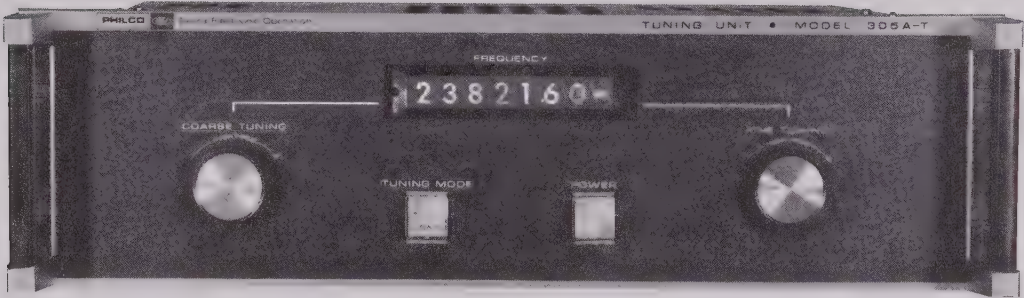


Figure 3-1. Model 305A-T Tuning Unit, Front View

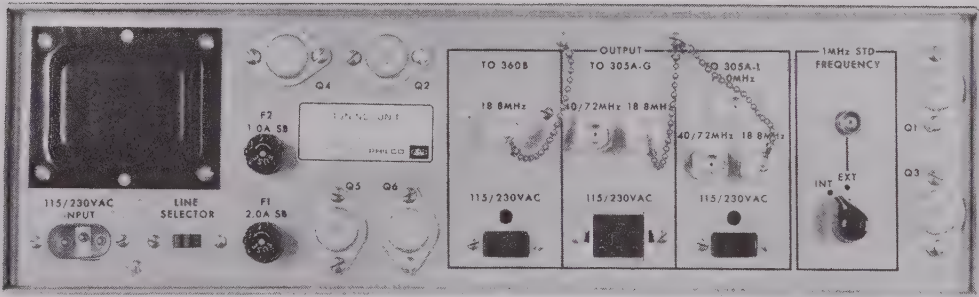


Figure 3-2. Model 305A-T Tuning Unit, Back View

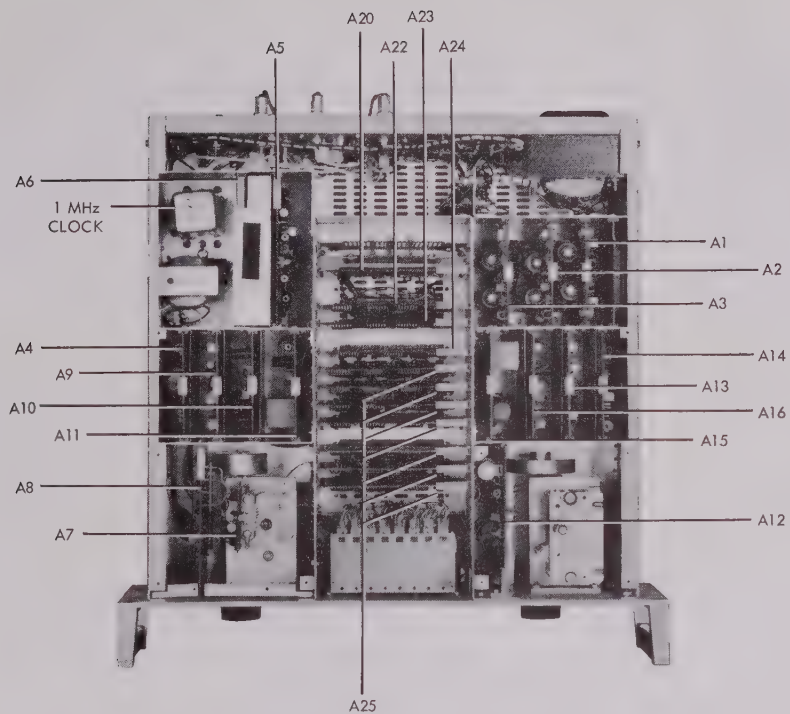


Figure 3-3. Model 305A-T Tuning Unit, Top View

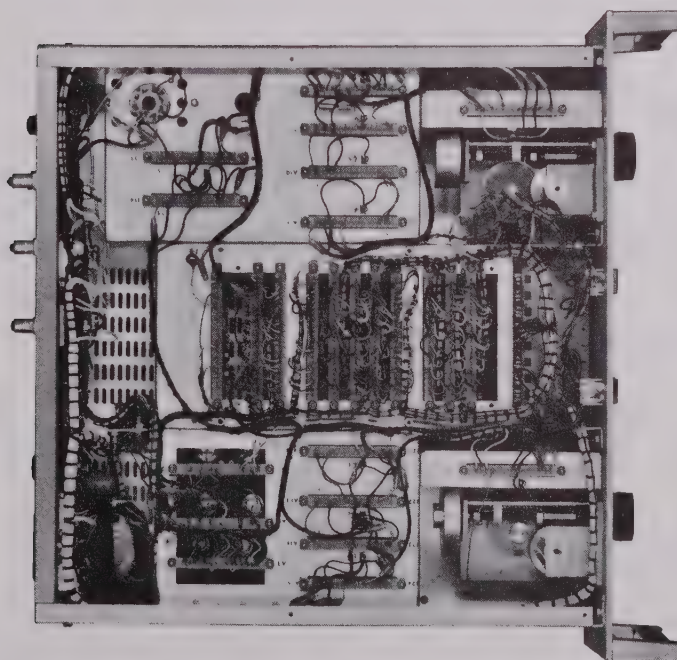


Figure 3-4. Model 305A-T Tuning Unit, Bottom View

The section receives the 100 kHz signal from the Frequency Synthesizer and an operating voltage from LOCK switch. It sends a 40.1 to 73.6 MHz signal to the Counter Section, to the Tracking Signal Generator and to the Frequency Selective Level Meter. The section also furnishes a ground for the Coarse Lock relay.

c. Fine Tuning Section

The Fine Tuning Section uses a Colpitts type oscillator to tune within the 100 kHz lock points of the Coarse Tuning Section. The section uses the reference 19.1 MHz signal from the Frequency Synthesizer Section and produces a 215 to 315 kHz signal (tunable on the front panel) for the Counter and Display Section, as well as a 18.785 to 18.885 MHz reference signal for the Tracking Signal Generator and the Selective Frequency Level Meter. The section also furnishes an energizing voltage for Fine Lock Relay K2 and illuminating voltages for LOCK and CONT indicators.

d. Counter and Display Section

The counter and display section counts and displays the frequency of the Fine Tuning and Coarse Tuning signals. It does this by counting the 100 kHz pulses from the divided and buffered master oscillator into 12,000 count cycles which are further divided into 240-count cycles. During the count it gates the Main Tuning and Fine Tuning signals for count in the decade dividers during certain specified periods. In doing this, the counter also generates preset, reset, and store commands.

e. Power Supply Section

The Power Supply Section receives 115 volt or 230 volt ac power from a commercial source, distributes 115 volt ac power to the Tracking Signal Generator and the Frequency Selective Level Meter, and provides -16 volt, -6.0 volt, +6.0 volt, and +3.2 volt dc power to the boards within the unit.

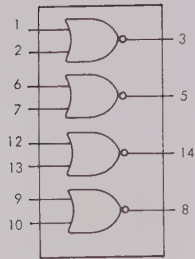
2. Integrated Circuits

The Tuning Unit makes use of twelve types of integrated circuits. See Figure 3-5 for a logic diagram of these circuits. See Figure 3-6 for the pin designations.

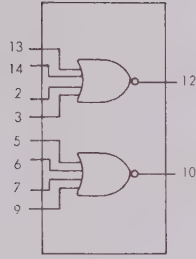
3. Circuit Description

Frequency Synthesizer

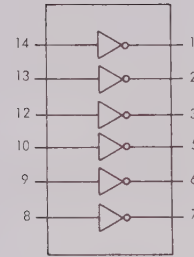
The Frequency Synthesizer components are mounted on three plug-in circuit board assemblies, A4, A5 and A6. See Figures 3-7 and 3-8 for component locations.



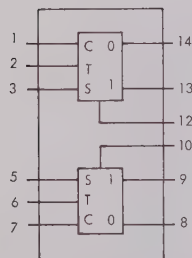
MC717P, MC724P



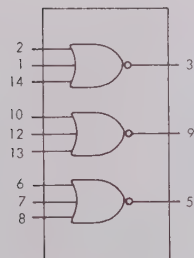
MC719P



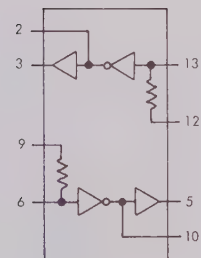
MC789P



MC790P



MC793P



MC799P

Figure 3-5. Integrated Circuits Logic Diagram

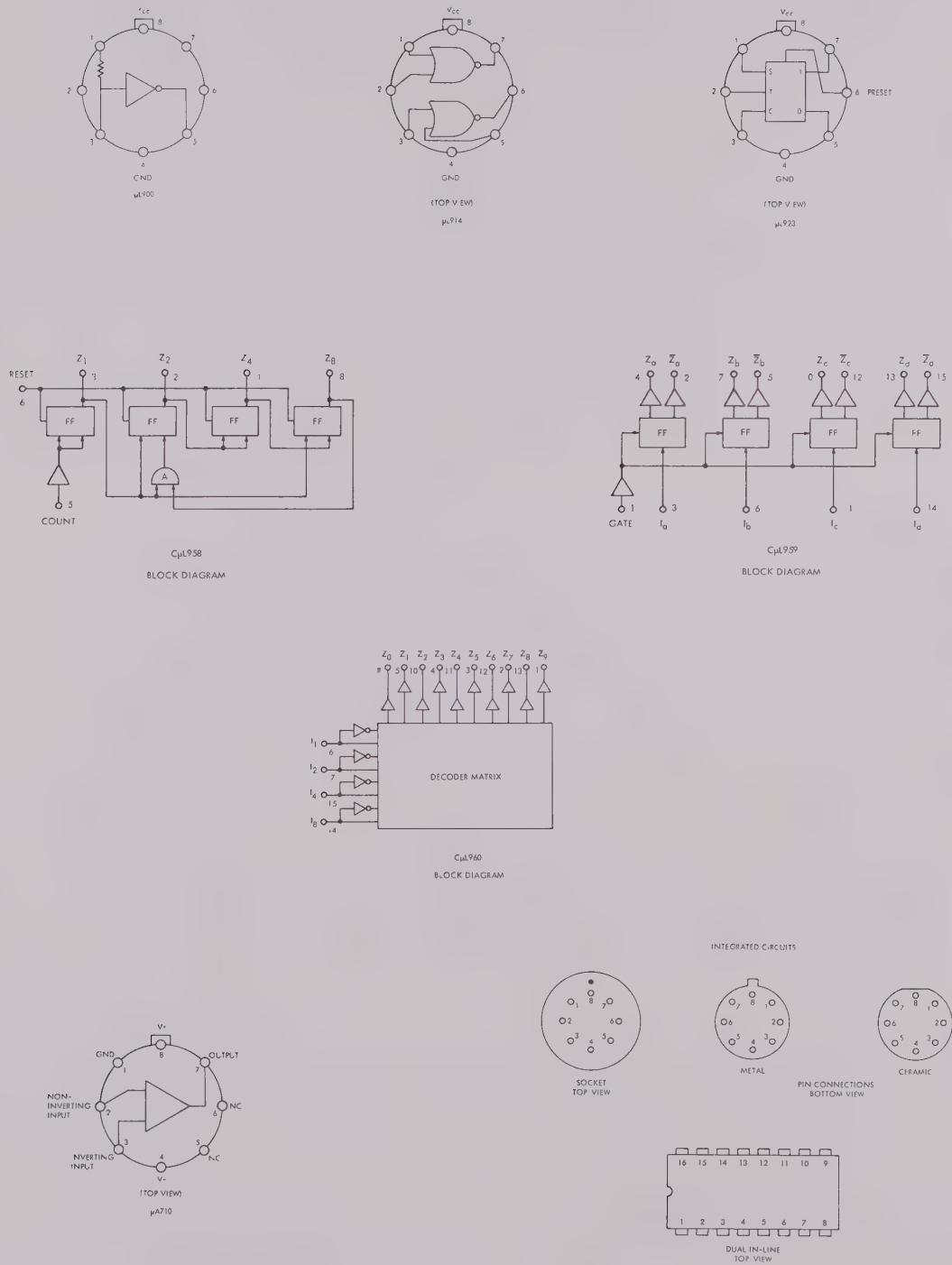


Figure 3-6. Integrated Circuit Pin Designations

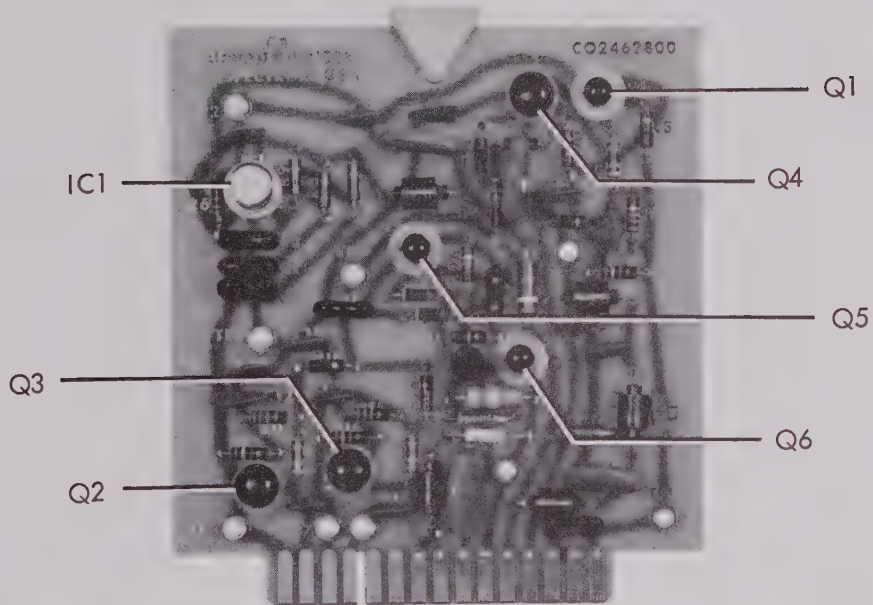


Figure 3-7. Board A4 Decade Divider and Spectrum Generator C02462800

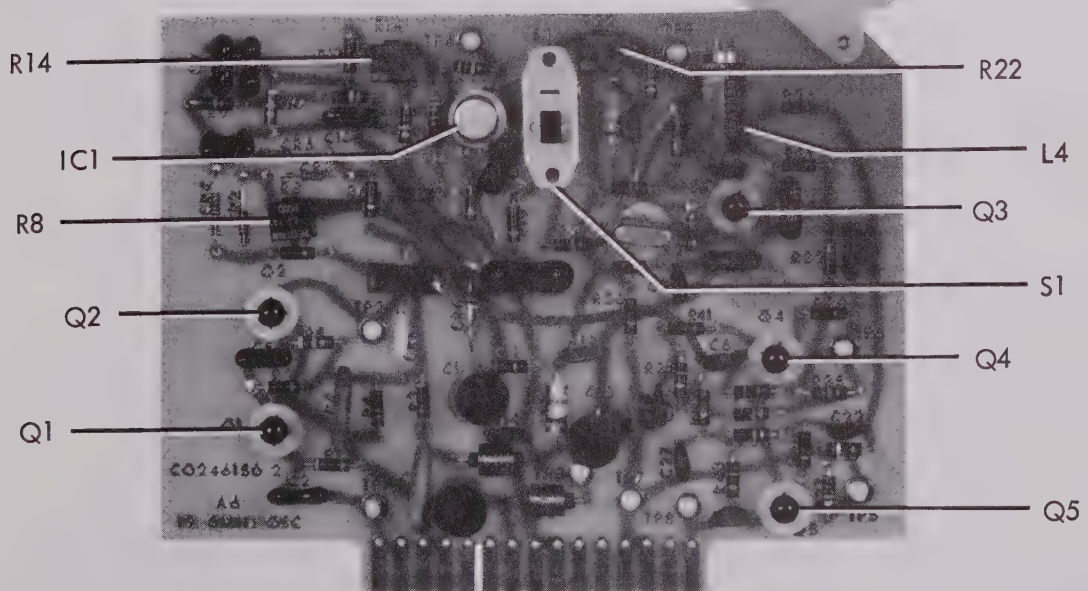


Figure 3-8. Boards A5 and A6 19.0 and 19.1 MHz Oscillator
C02461501 and C02461502

See Figure 6-2 for the schematic diagram.

The precision 1 MHz oscillator is a separate plug-in module.

The oven stabilized, precision 1 MHz crystal oscillator produces the basic clock frequency for the complete system. Output of the oscillator feeds board A4 through an emitter follower, Q1, which sends the buffered signal to a digital type decade divider C_uL 958. See Figure 3-9. The 100 kHz output of the decade divider has a rectangular waveform. Three emitter follower isolation amplifiers, Q2, Q3 and Q4 and one pulse peaking amplifier Q5, Q6, couple the 100 kHz signal to the four circuits in which this frequency is used. TUNING MODE switch switches the -16V to the pulse peaking amplifier. Thus cutting off the 100 kHz to the lock circuits when the TUNING MODE switch is in the CONT position.

Two crystal-controlled phase-locked oscillators, 19.1 MHz on board A5 and 19.0 MHz on board A6, are identical in every respect except for the frequency of the crystal used. Pulse peaking amplifier Q1 and Q2 peaks the leading edge of the 100 kHz output of board A4. Diode CR1 clips the trailing edge.

Transformer T1 couples the greatly peaked 100 kHz signal to the top of a constant current diode bridge, CR2 through CR5. Transistor Q5 furnishes a 19.0 MHz (19.1 MHz) signal through GAIN ADJUST resistor R8 to the junction of CR2 and CR3, causing CR4 and CR5 to conduct proportionately with the error voltage.

Low-pass filter, C7 through C10, in conjunction with R9 through R11, filters the 100 kHz component from the signal that was furnished by the diode bridge, and sends the resulting envelope voltage through an operational amplifier, to a crystal controlled 19.0 or 19.1 MHz oscillator. The voltage so produced controls the capacitance of varactor CR7, thus increasing or decreasing the frequency of the oscillator in order to lock the output phase to the phase of the 190th (191 st) harmonic of 100 kHz.

Emitter follower Q5 taps the 19.0 MHz (19.1 MHz) output from the load resistor of Q3, sends the 19.0 MHz signal to the level meter, and sends the 19.1 MHz signal to the reference mixer.

Switch S1 opens the phase lock circuits closed loop so that the oscillator may be peaked. The 20K potentiometer, R22, adjusts the bias to perform this peaking.

Potentiometer R14 adjusts the bias to balance the operational amplifier.

The Frequency Synthesizer furnishes a 19.0 MHz output for the Level Meter unit. It also furnishes one 100 kHz output to the counter and one to the Coarse Tuning Mixer.

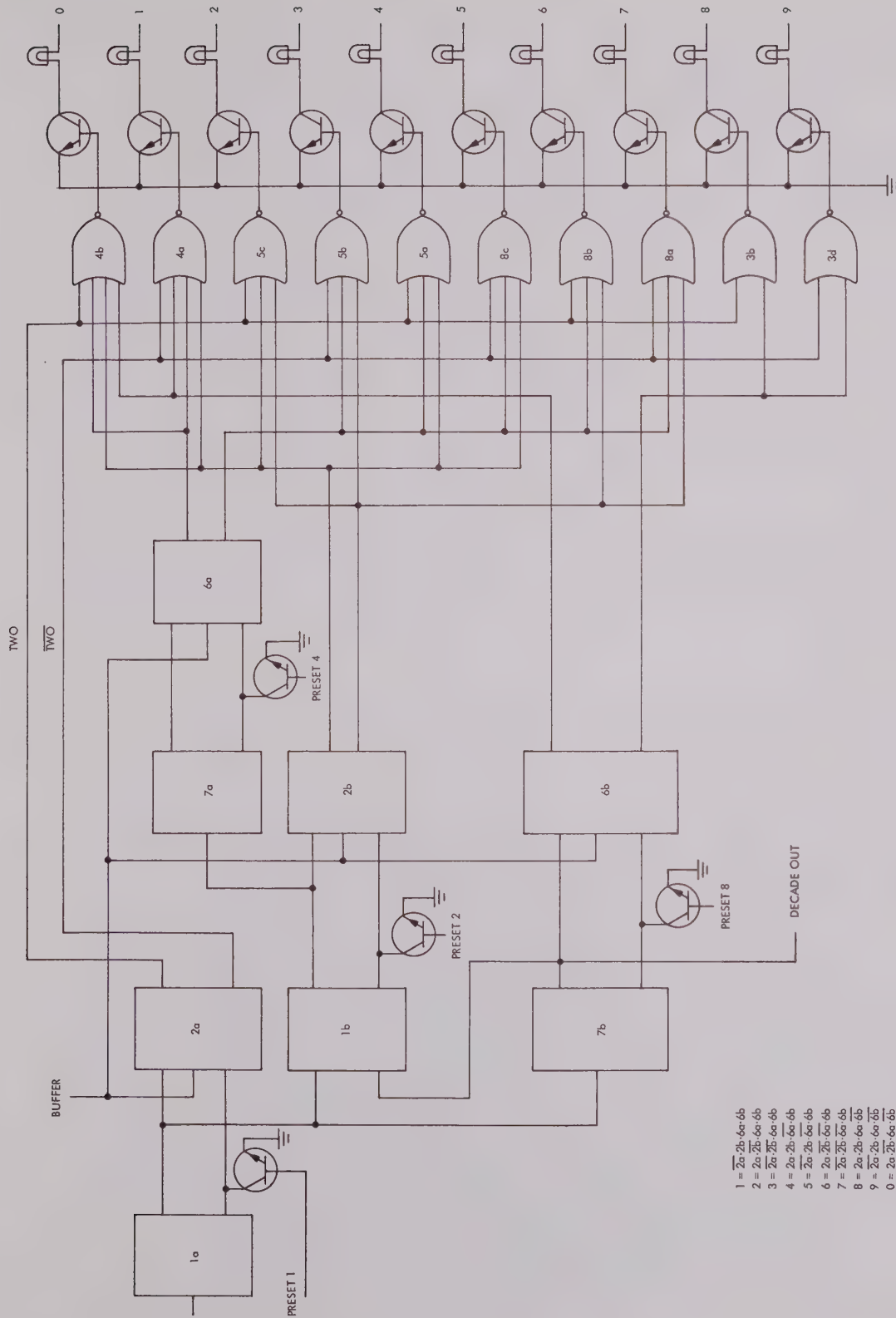


Figure 3-9. Decade Logic

b. Coarse Tuning Oscillator

The Coarse Tuning Oscillator section is made up of five circuit boards. Coarse Tuning Oscillator, A7: Coarse Tuning Amplifier and Output, A8: Mixer A9: Amplifier Detector, A10: and Coarse Tuning Lock sensor, A11. See Figures 3-10 through 3-14 for component location. See Figure 6-3 for the schematic diagram.

The Coarse Tuning Oscillator, board A7, a highly stabilized Colpitts type circuit, may be tuned over the range of 40.1 to 73.6 MHz by COARSE TUNING capacitor, C1, on the front panel. Board A7 is mounted directly on the frame of C1 so that leads are kept short and operational stability ensured. An error voltage applied to varactor diode CR1 accomplishes phase lock.

The Coarse Tuning Oscillator sends a 1.2 volt p-p sinewave and a 2 volt p-p sinewave to the Coarse Tuning Amplifier and Output, Board A8.

The Coarse Tuning Amplifier and Output, A8, amplifies the 1.2 volt output of the Tuning oscillator through amplifiers Q1 and Q2, then buffers the signals through three similar emitter follower pairs: Q3-Q4, Q6-Q7, and Q8-Q9. The signals produced by these emitter-follower pairs are sent to the Counter, the Level Meter, and the Signal Generator.

The Coarse Tuning Amplifier and Output also amplifies the 2-volt signal through the wide-band amplifier Q5 and sends the signal to the Mixer, A9.

The oven-stabilized, crystal-controlled 1 MHz oscillator, XC01, provides a highly accurate 1 MHz signal. Emitter-follower, Q1, on board A4, buffers this 1 MHz to a decade divider. The spectrum generator, Q5 and Q6 then peak the resulting 100 kHz signal and sends the resulting signal to the first mixer, Board A9. The peaked input to Board A9 is rich in high-order harmonics.

The peaked waveform output of the 100 kHz Oscillator and Harmonic Generator is applied to the primary of the First Mixer transformer T1 where, due to the resonant rise across the transformer inductance, it becomes still more sharply peaked. The negative swing is cut off by diode CR1, leaving a narrow positive going pulse as the waveform in the transformer primary.

The output of the Coarse Tuning Oscillator is applied to the center-tap of the secondary of T1. The combined inputs to T1 are applied to diodes CR2-CR3 which, since they conduct in only one direction, allow an output only for the duration of each 100 kHz pulse.

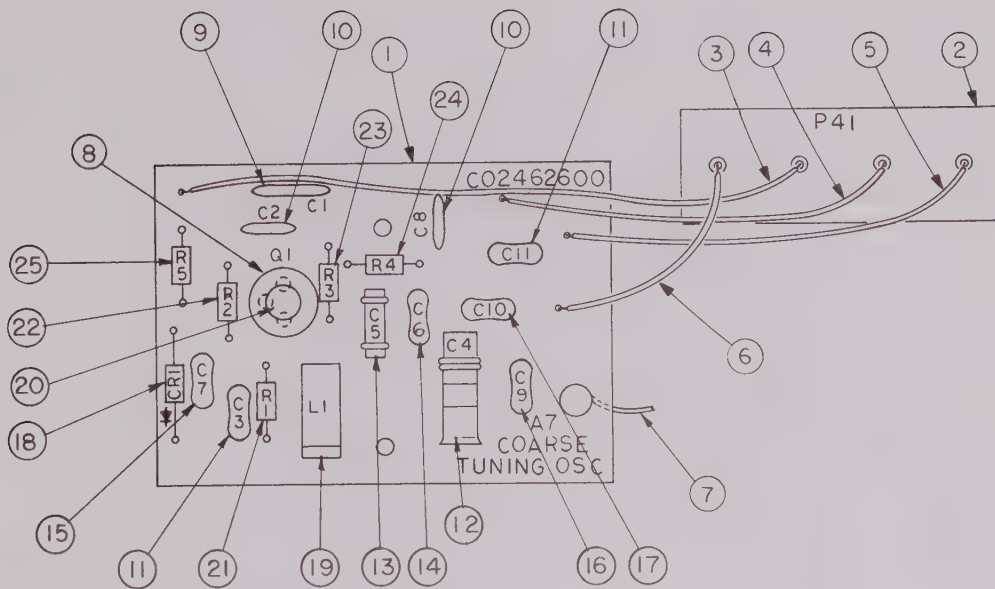


Figure 3-10. Board A7 Coarse Tuning Oscillator C02462600

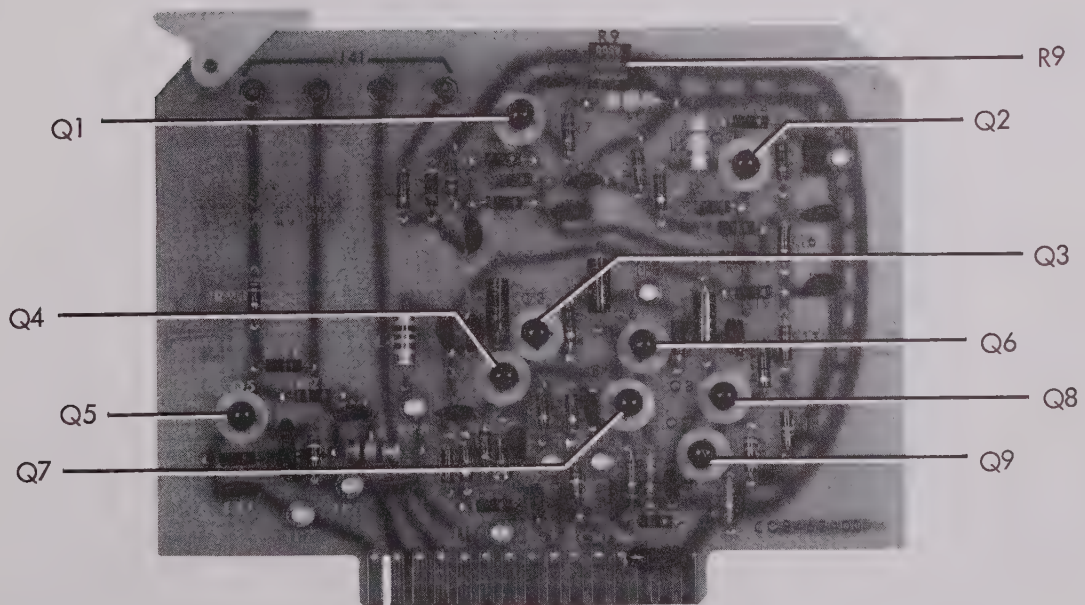


Figure 3-11. Board A8 Coarse Tuning Amplifier and Output C02462400

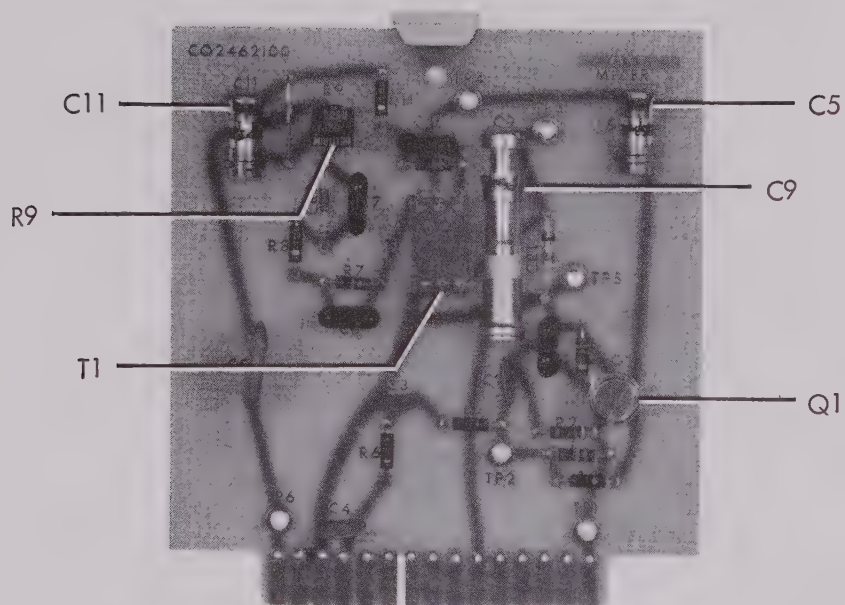


Figure 3-12. Board A9 Mixer C02462100

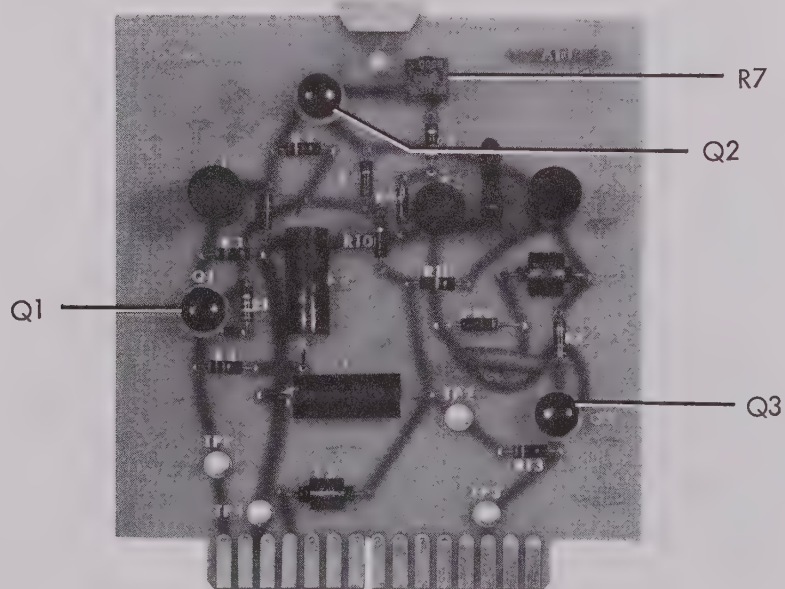


Figure 3-13. Board A10 Amplifier-Detector C02461900

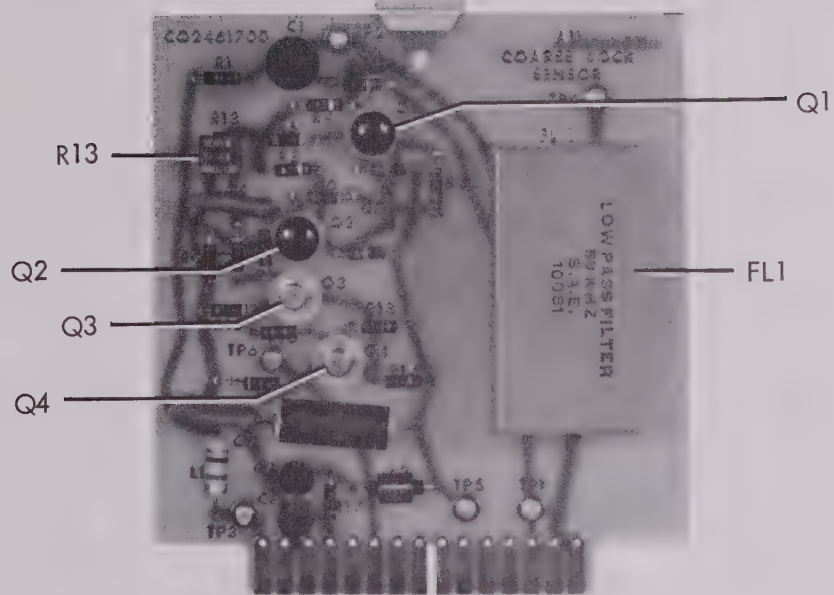


Figure 3-14. Board A11 Coarse Lock Sensor C02461700

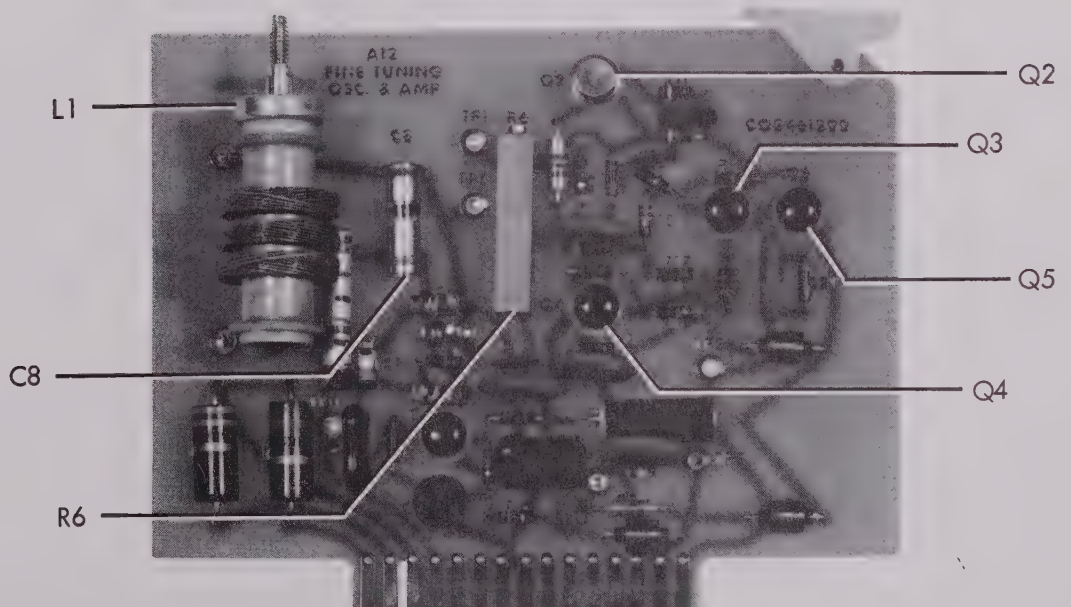


Figure 3-15. Board A12 Fine Tuning Oscillator and Amplifier C02461200

The output to the Amplifier Detector is therefore a wave containing components of both the Coarse Tuning Oscillator frequency and the fundamental and harmonics of the 100 kHz frequency. When the Main Tuning Oscillator frequency is exactly a harmonic of the 100 kHz oscillator frequency, the output appears as a 100 kHz pulse.

The 100 kHz pulses are of constant amplitude provided the Coarse Tuning Oscillator frequency does not attempt to drift, or the Coarse Tuning Capacitor is not changed slightly. If either of these situations occur the pulses increase or decrease in amplitude, depending on the direction of attempted frequency change. This change in amplitude is due to change in phase relationships between the 100 kHz pulse and the Coarse Tuning Oscillator signal, and is detected by the succeeding circuits. Such a change generates an error voltage which is immediately applied to the varactor diode and changes its effective capacity slightly. The capacitance change is in the proper direction to maintain the Coarse Tuning Oscillator frequency in harmonic relation to the 100 kHz signal. Thus in the locked condition the frequency of the Coarse Tuning Oscillator does not vary. Error voltage is developed by change in phase relationships only.

When the Coarse Tuning Oscillator is not in the locked condition the amplitude of the 100 kHz pulses continuously varies. The frequency of the envelope of these variations is the difference between the Coarse Tuning Oscillator frequency and the frequency of the nearest 100 kHz harmonic, and thus will never be greater than 50 kHz. In this condition the LOCK Indicator light goes out.

Output from the First Mixer is passed through an emitter-follower, Q1, and a common-emitter amplifier, Q2, in the amplifier Detector module, A10, and applied to the base of the detector stage, Q3. The detector output is connected to the Low-Pass Filter, a two stage unit with a cutoff frequency of 50 kHz.

When the 100 kHz pulses out of the Mixer are of constant amplitude, the 100 kHz modulation recovered by the detector is removed by the low-pass filter, and the filter output is a dc voltage which is proportional to average pulse amplitude. A change in average pulse amplitude will therefore cause a change in dc voltage. This is the error voltage that is applied to the varactor diode to maintain the Coarse Tuning Oscillator on frequency, in the locked condition.

When the pulses are continuously varying in amplitude, the unlocked condition, the modulation envelope is detected. Since the envelope frequency is always less than 50 kHz, as noted above, this alternating signal passes through the low-pass filter.

The same alternating voltage is applied to the varactor diode, but because it fluctuates rapidly it will not cause the oscillator to lock in. When the Coarse Tuning Oscillator is adjusted so that it is close to a 100 kHz harmonic frequency and the alternating voltage frequency is reduced sufficiently, a point is reached at which the lock circuits take

control; the low-pass filter output becomes dc, the Schmitt trigger in the Coarse Lock Indicator module is cut off and the LOCKED indicator light comes on.

c. Fine Tuning Oscillator

Five circuit boards mount the components of the Fine Tuning Oscillator section: Fine Tuning Oscillator and Amplifier, A12, Second Amplifier and Phase Discriminator, A13; Fine Lock Sensor, A14; Second Oscillator, A15; and Reference Mixer, A16. See Figure 3-15 through 3-19 for component location. See Figure 6-4 for the schematic diagram.

To adjust the tuner to frequencies between the 100 kHz, lock points, adjust FINE TUNING control, C2, on the front of the cabinet.

The Fine Tuning Oscillator and Amplifier board, A12, consists of oscillator and amplifier sections. The oscillator is a very stable Clapp oscillator. FINE TUNING control, C2 tunes the oscillator to any frequency between 215 kHz and 315 kHz. Amplifiers Q2 and Q3 amplify the signal produced by the oscillators. The emitter-followers buffer the result before sending the signals to the counter and to the Second Amplifier and Phase Discriminator Board A13.

The Second Oscillator, Board A15, consists of a 18.885 to 18.785 MHz oscillator and four emitter followers, Q2 through Q5. Error voltages applied to varactor CR1 controls the exact frequency of the oscillator. The emitter followers buffers the second oscillator frequency to the level meter, the signal generator, the spectrum display unit and the Reference Mixer, board A16.

Control of the Second Oscillator by the Fine Tuning Oscillator requires a stable reference frequency provided by the 19.1 MHz phase locked crystal Oscillator. The 19.1 MHz oscillator output is fed into the primary of mixer transformer T1. A signal from the Second Oscillator is fed into the center tap of the secondary of this same transformer through isolation amplifier Q3. These signals are mixed in the output circuit to form a difference frequency which is taken out at the arm of potentiometer R1. The difference frequency, determined by the tuning of the Second Oscillator, covers the range of 215 to 315 kHz.

Mixer output goes to a common-emitter and an emitter-follower stage to the Second Amplifier and Phase discriminator board where the signal is raised to a suitable level for application to the Phase Discriminator.

In the Phase Discriminator the 215-315 kHz frequency of the Fine Tuning Oscillator is fed into the primary of T2. The 215-315 kHz output of the Reference Mixer is fed into the primary of T2. The output connections of the secondaries of these transformers, the diodes CR2 and CR4 and associated components form the phase discriminator circuit. When the two input signals are the same frequency, the output appears as a half-wave rectified signal. The high-pass filter on board A13, composed of C11, C12, L2, L3, CR1, CR3 and CR9, produces a positive steering voltage. The output of the phase discriminator,

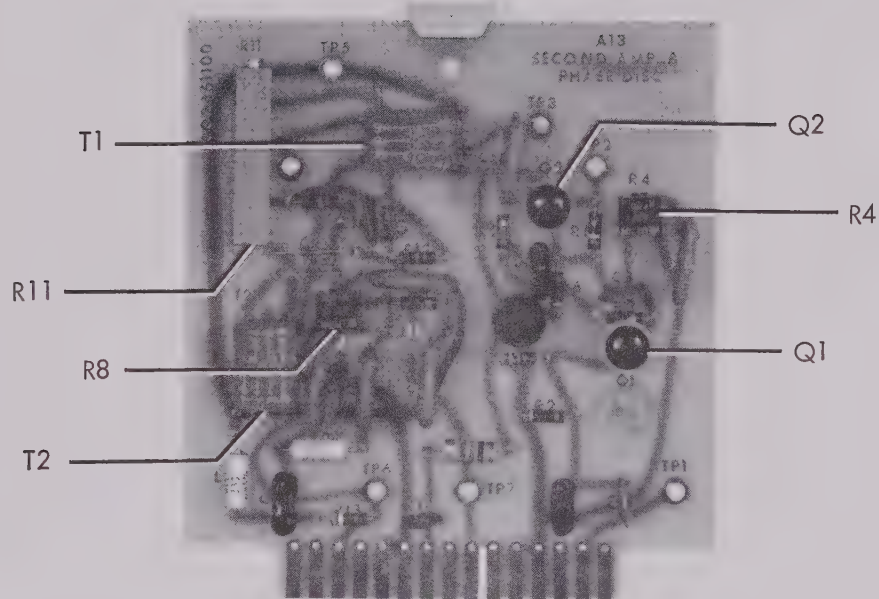


Figure 3-16. Board A13 Second Amplifier and Phase Discriminator
C02461100

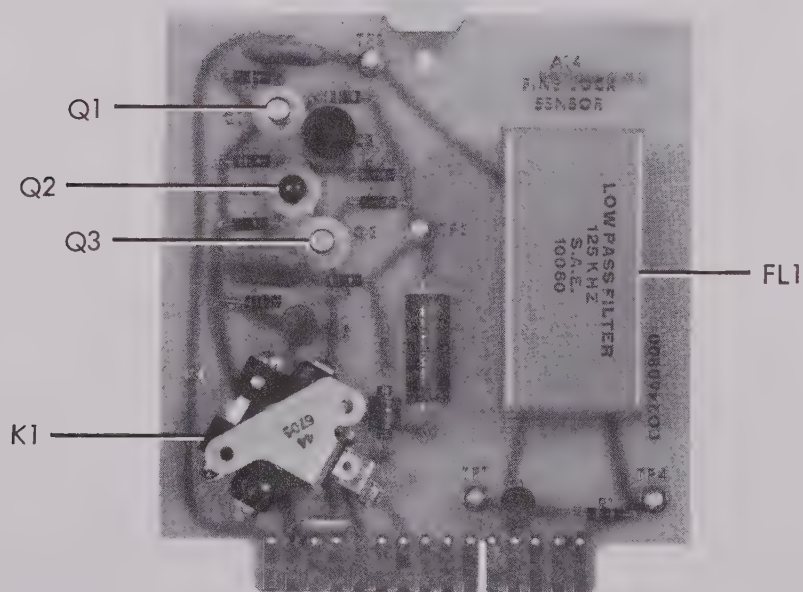


Figure 3-17. Board A14 Fine Lock Sensor C02460800

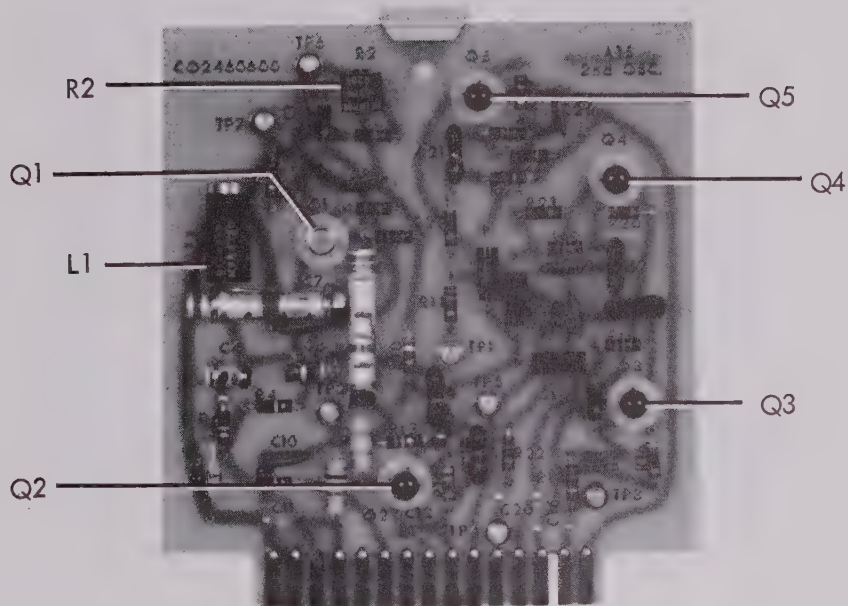


Figure 3-18. Board A15 Second Oscillator C02460600

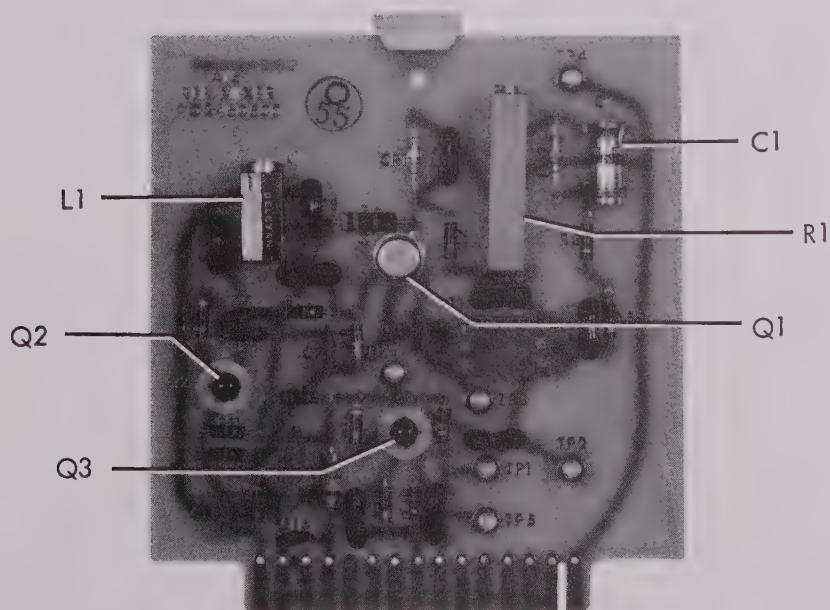


Figure 3-19. Board A16 Reference Mixer C02460500

when superimposed on the steering voltage, establishes the error voltage to be applied to the varactor on the second oscillator board.

The dc voltage output of the Low-Pass Filter is connected to the varactor diode in the Second Oscillator and controls the frequency of this oscillator. Control is sufficient to keep the Second Oscillator continuously locked to the Fine Tuning Oscillator over its full range of tuning. Since the Second Oscillator output frequency when mixed with the output of the 19.1 MHz Reference Oscillator must generate an output that is the same frequency as that of the Fine Tuning Oscillator for locking to take place and continue, the control of the Fine Tuning Oscillator over the Second Oscillator is exact. Therefore, the oscillators are in the phase locked condition for every setting of the Fine Tuning Oscillator.

The Fine Lock Sensor, board A14, consists of a low-pass filter, an emitter-follower, a schmitt trigger and a relay. When the low-pass filter passes a voltage containing an ac component, capacitor C2 couples a portion of that varying voltage to the base of Q1, driving Q1 into conduction. Capacitor C2 and resistor R2, along with capacitor C3 and resistor R3 maintain Q1 in that state. Capacitor C3 couples the negative-going pulse to the base of Q2, thus triggering the Schmitt Trigger, Q2 and Q3. Capacitor C3 and Resistor R4 keep Q2 cut-off for approximately 1/50 second. When Q2 cuts-off, Q3 conducts, energizing K1, and removing 12 volts ac from LOCK indicator.

TUNING MODE switch S2, when in the LOCK condition furnishes 12 volts ac to the LOCK indicator (K1-A4), and K1 Panel energizer energizing relay K2, and K3.

Board A20 is a centinary divider. See Figure 3-20. It converts the 0.7 volt peak-to-peak 39.8 to 72.3 MHz sine wave from the Coarse Tuning Amplifier (A8) into a 6 volt peak-to-peak signal, divides the signal frequency by 100, and converts the resulting signal to a square pulse alternating from +0.4 volts to +3.2 volts. The board consists of an amplifying gate, eight flip-flop modules, a level-restoring module and a gate module.

The signal is amplified by IC1, divided by flip-flop IC2, then again by flip-flop IC3. The frequency is then divided by five by flip-flops IC4, 5 and 6, then again by flip-flops IC7, 8 and 9 (See Figure 3-21 for an illustration of the divide-by-five logic.

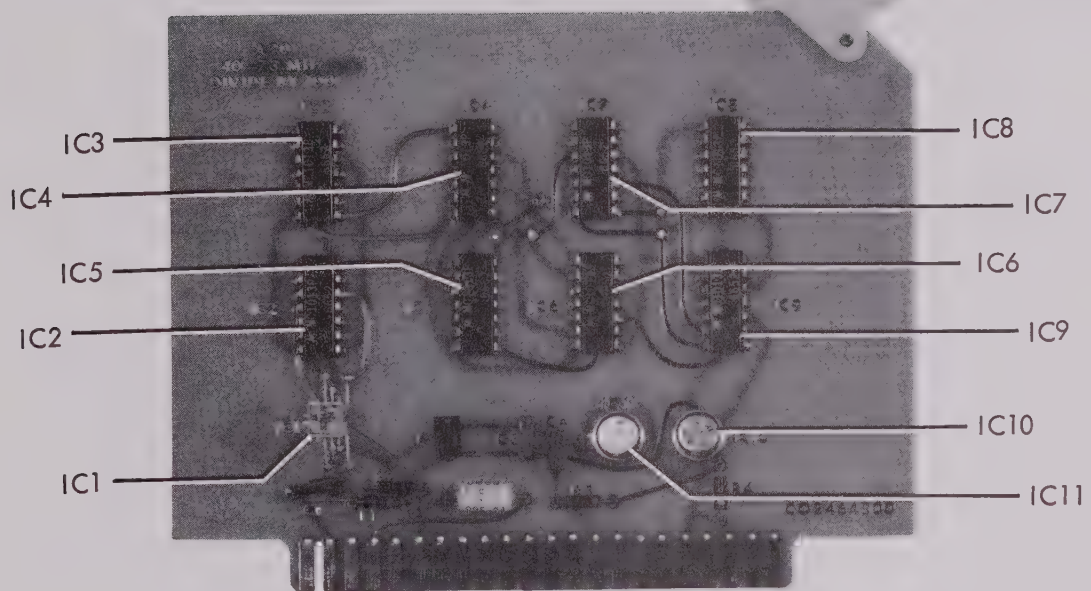
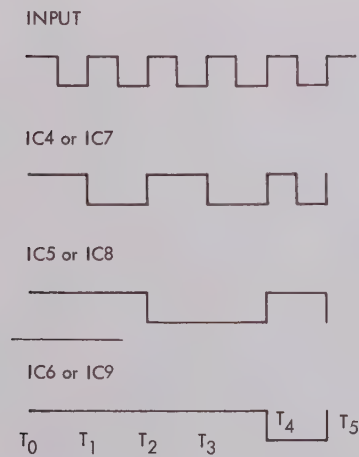


Figure 3-20. Board A20 Centinary Divider C02464800



DIVIDE-BY-FIVE LOGIC

Figure 3-21. Divide-By-Five Logic

A restorer in IC11 and gates in IC10 convert the pulses from the divider, (0.0 volt false and -6.0 volts true) to the logic levels used in subsequent stages (+0.4 volt false and +3.2 volt true).

d. Counter and Display

The control logic boards, Boards A22 and A23 (See Figure 6-5 for the logic diagram and Figures 3-22 and 3-23 for the component locations and Figure 6-6 and 6-7 for the schematic diagrams) consists of sixteen flip-flops, twenty-five gates and eleven amplifiers.

Flip-flops 2B, 2A, 1B and 1A on Board A22, divide the 100 kHz master timing signal by 10, and flip-flops 2B, 2A and 1B on Board A23 further divide the signal by five (See Figure 3-21 for a demonstration of divide-by-five logic). Flip-flops 1A, 3B, 3A and 6B on Board A23 then start counting the resulting 2 kHz signal in 10-count cycles. NOR gate 4A gates at count 3. NOR gate 4B on Board A23 gates at count 5 and NOR gate 4C gates at count 7. Chip 5 reinverts the resulting counts. To this point, the counter has actually counted 500 of the 100 kHz pulses, but, since all logic occurs from the presentation of the 2 kHz signal at pin 6 of flip-flop 1A on Board A23, the 2 kHz signal will be considered as the basic signal so the counter has thus counted to 10.

Flip-flop 6A on Board A23 divides the count by two furnishing the count of 20. Flip-flop 6A on Board A22 furnishes the count of 40, and the flip-flop 6B on Board A22 furnishes the count of 80. Flip-flop 6B and 8B are so connected as to furnish the counts of 160 and 240.

The output of the NOR gates used in this counter are high only when all inputs are low.

Gate 5C NORS the counts of the 80-count flip-flop and the output of the 240-count flip-flop. Referring to the timing diagram, both inputs are low only between counts 200 and 240. Inverter 4B on Board A22 inverts the output of 5C, thus enabling gates 3A, 3C and 5D during this period. The uninverted output of 5C disables gate 7C at count 200. This gate from counts 0 to 199, has been sending the low-frequency tuning signal for count and display to the decade counters.

The output of gate 3C goes high only between counts 230 to 240. When reinverted by amplifier 4D, this signal enables gates 9C, 9D and 7D.

The output of gate 5A is high during the counts 20 to 29 in every 40-counts, thus disabling gate 7A during that period. Since gate 3A was enabled by the inverted output of gate 5C between counts 200 and 239, the output goes high only during the first decade of that 40-count—that is, only between counts 200 and 209. Inverter 4C inverts the output to enable gates 7A, 7B and 7C on Board A23 during this period.

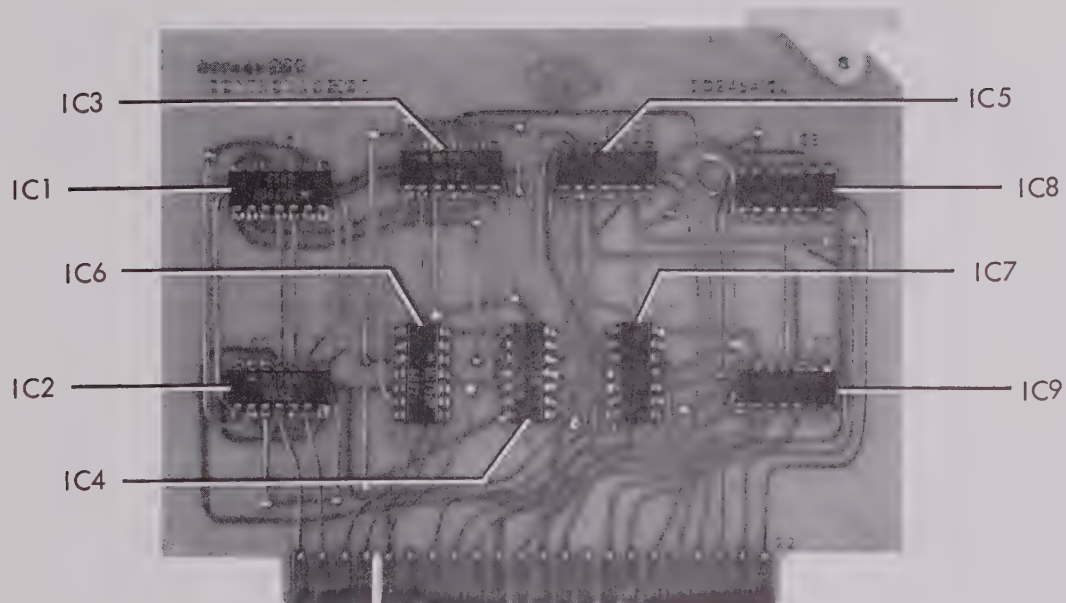


Figure 3-22. Board A23 Control Logic #1 C02464400

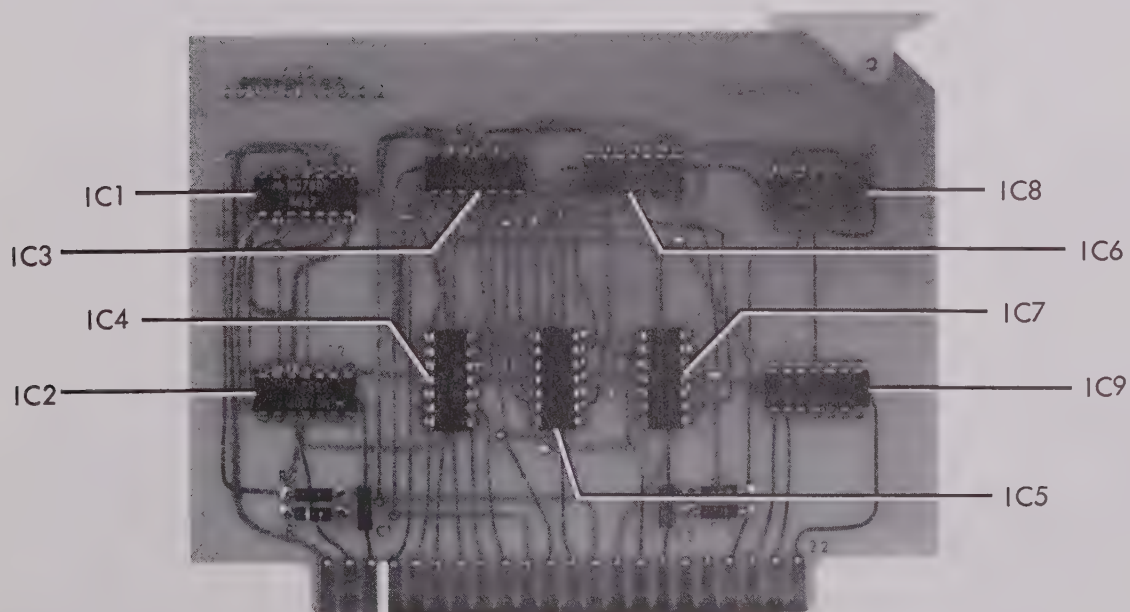


Figure 3- 23. Board A22 Control Logic #2 C02464100

The output of gate 5B is high during counts 10 to 19 in any 40-count, thus disabling gate 7A during that period.

The output of gate 7A is low whenever either input is high. Since the inverted output of gate 5C is low only between the counts of 200 and 239, and the output of gate 5B is low during counts 10 through 29 in any 40-count, the output of gate 5D is high only between the counts of 210 and 229. Inverter 4A inverts the high to a low and opens gate 7B to the divided-by 100 signal from the main tuning control.

Gate 7D thus sends the signal from Fine tuning section to the decade counters for the first 0.1 second, rests for 0.005 seconds, sends the signal from the main tuning section to the decade counters for 0.01 second, then again rests for 0.005 seconds.

The count 230 to 239 low level signal from inverter 4D enables gate 9C. At count 237, Gate 9C sends a Preset-85 kHz to the 1 and 10 kHz decades.

When the signal from inverter 4C enables gate 7C, during the count from 200 to 209, count 7 makes the output high. Inverter 4E inverts the output and sends the enabling signal to gates 3B on Board A22 and 9A and 9B on Board A23.

In the presence of a decode 2 signal, at count 207, Inverter 5D will preset the 1 MHz decade board to 1 prior to the next counting cycle. If there is a Decode 3 signal gate 5A will preset the fourth flip-flop on the 100 kHz board and gate 9A will also activate the first flip-flop on the board to display a nine on the frequency display for the board. If there is a Decode 4 signal from the mode board at count 207, gate 9B will activate the fourth flip-flop on the 100 kHz decade board, and the frequency display will thus start its first count on 9.8 MHz.

Count Reset command occurs at counts 205 and 235. At count 205, the output of amplifier 4A is low. When the counter has reached 5, the output of gate 7B goes high, gate 9A on Board A22 goes low, and inverter 9B on Board A22 goes high, sending a positive Reset command to the decade boards. Similarly, at count 235, gate 9D sends an identical signal.

At count 203, Gate 8B which is enabled during counts 200 to 209, sends the Low Frequency Store command to the low-frequency decade boards. Similarly, at count 233, Gate 8A sends the Store command to the 100K, 1M and 10M decade boards. The Decade divider portion of the counting section consists of seven identical decades and a mode decade. (See Figures 3-25 and 3-26.) Each decade board consists of a simple four flip-flop counter, plus four storage flip-flops. The outputs of the storage flip-flops are gated to the applicable lights in the frequency display.

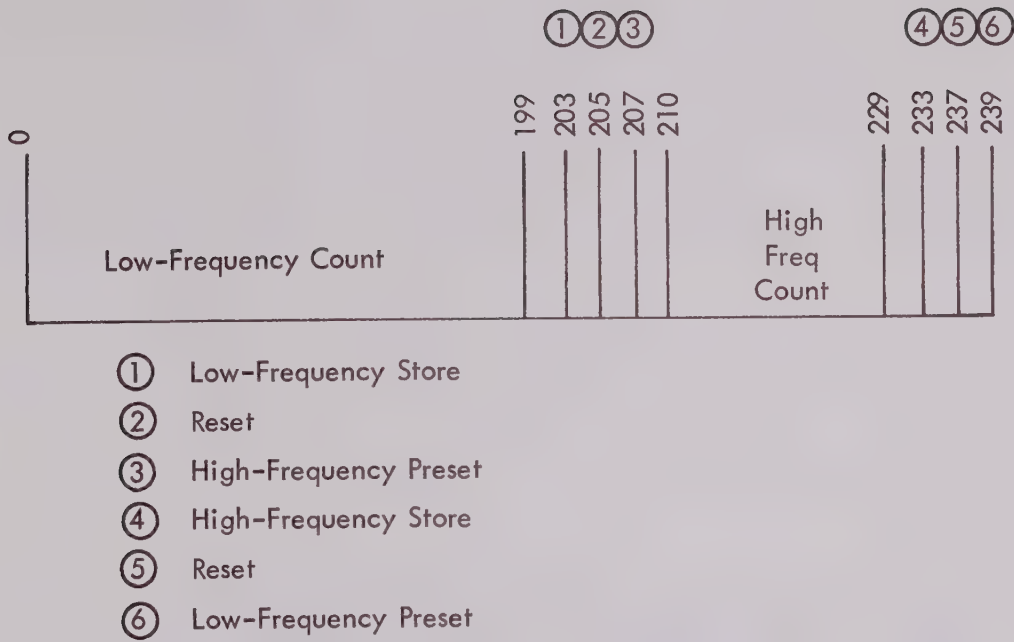


Figure 3-24. Counting Action

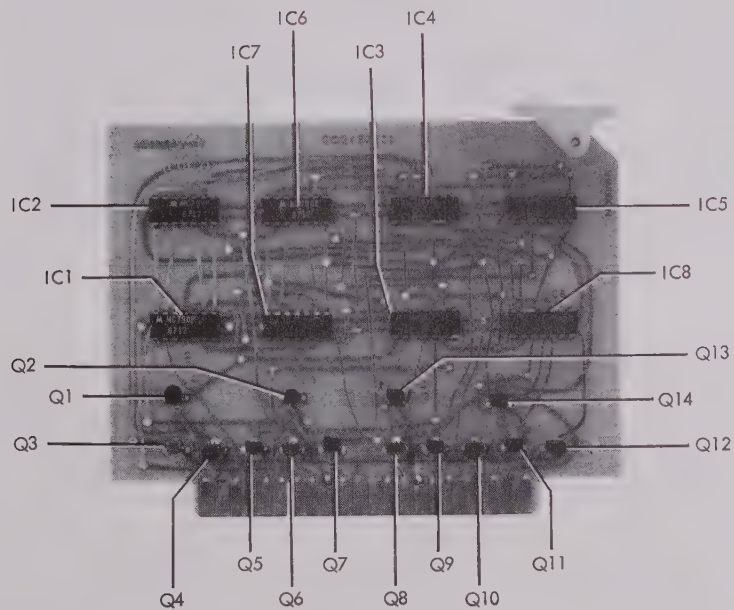


Figure 3-25. Board A25 Decade Divider C02487900

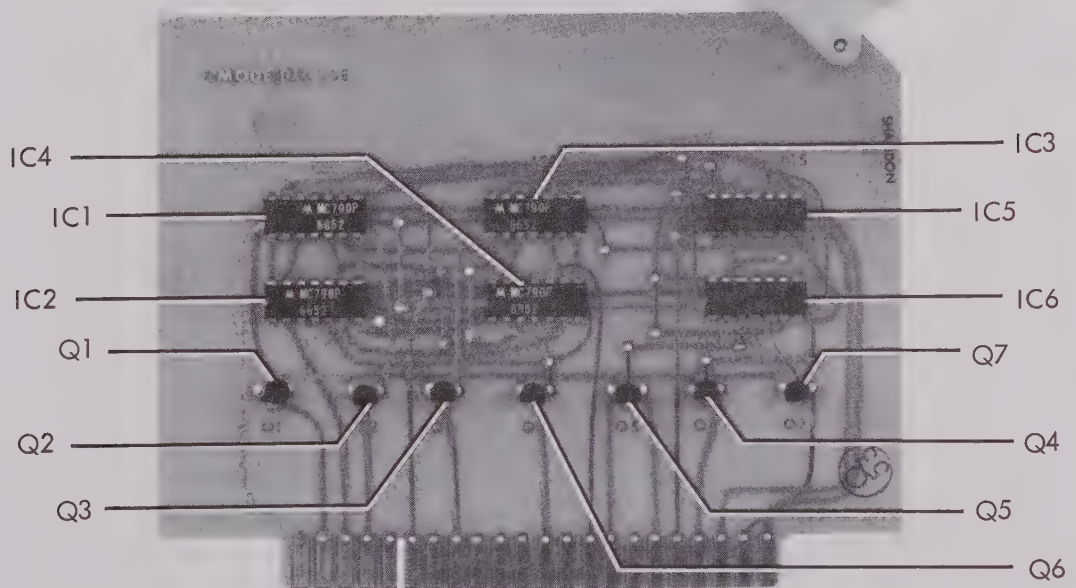


Figure 3-26. Board A24 Mode Decade C02487800

The decade counting sequence follows. Assume that all flip-flops have been reset, and the 1 kHz, the 4 kHz, and the 80 kHz flip-flops have been preset.

Gate 7C of the control logic applies the 215 to 315 kHz fine tuning frequency to the input of the 10 Hz decade for the first 0.1 second. At count 203 Low Frequency Store command transfers the states of the input decade flip-flop to the low-frequency storage flip-flops for display on the frequency readout. At count 207, both low frequency and high frequency flip-flop reset.

From counts 210 to 219, gate 7D sends the divided by 100 high-frequency signal from the main tuning oscillator to the decade counter. The 10 Hz decade divider divides the signal and sends it to the preset high-frequency decades as follows:

If the overflow from the low frequency decades was 2, Preset 9.8 MHz
 3, Preset 9.9 MHz
 4, Preset 10.0 MHz

Since the coarse tuning frequency is always 40.1 MHz above the displayed frequency, any count of below 50 MHz indicates that the coarse and fine tuning oscillators are tuned below the frequency of the local oscillators. For this reason the 40 MHz storage flip-flop is active, it operates K3 which turns-off the numerical display lamps and turns-on MHz low indicator.

Since the fine tuning frequency is 215 Hz above the fine tuning control setting, an 85 kHz is always preset into the low-frequency decades, a 0 Hz control setting sends a 300 kHz signal to the low-frequency decades. The overflow from the 10 kHz flip-flop is sent to the mode board. If the overflow is a 2, the mode board lights kHz LOW indicator on the frequency display and presets 9.8 MHz on the high frequency decades. This means that the fine tuning oscillator is tuned below the frequency of the third IF. If the overflow is a 3, the mode board lights the kHz indicator on the frequency display and presets 9.9 MHz on the high-frequency decades. This means that the fine tuning oscillator is tuned between 215 kHz and 315 kHz. (Remember the 85 kHz preset.) If the overflow is a 4, this means that the Fine Tuning oscillator is tuned to a frequency which is analogous to more than 100 kHz, and the kHz HIGH indicator lights. The mode board presets 10.0 MHz on the high frequency mode board.

The Mode Decade Board A24 receives the high frequency reset signal and the decade out signal from the 10 kHz decade counter. If the decade out signal from the 10 kHz decade divider is TWO, a lamp driver in the Mode Decade lights kHz LOW indicator; if it is THREE, kHz indicator lights, and if it is FOUR kHz high indicator lights. The Mode Decade also sends inputs to the low frequency control logic so that board can gate to preset the decade dividers.

e. Power Supplies

Boards A1 (See Figure 3-27), A2 (See Figure 3-28) and A3 (See Figure 3-29) mount the power supplies. The chassis mounts two bridge rectifiers and the transformer. See Figure 6-11 for the schematic diagram and Figure 6-12 for the power distribution diagram.

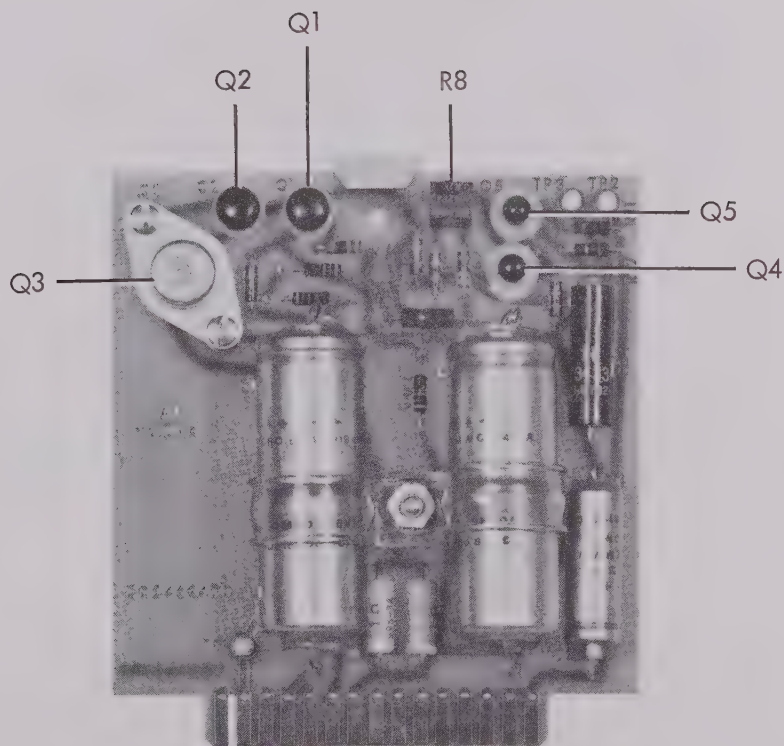


Figure 3-27. Board A1 +6-Volt Power Supply C02463400

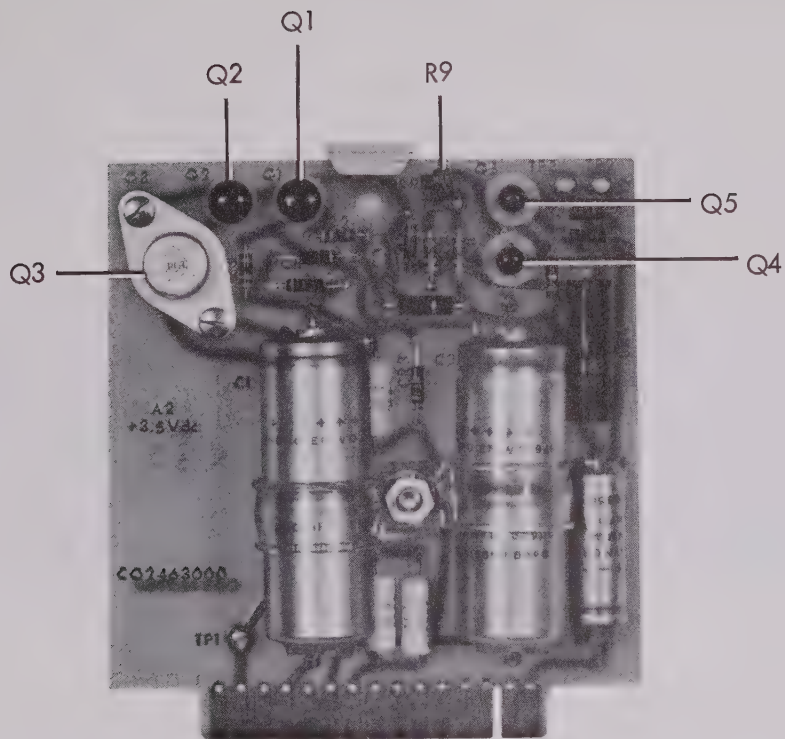


Figure 3-28. Board A2 +3.2 Volt Power Supply C02463000

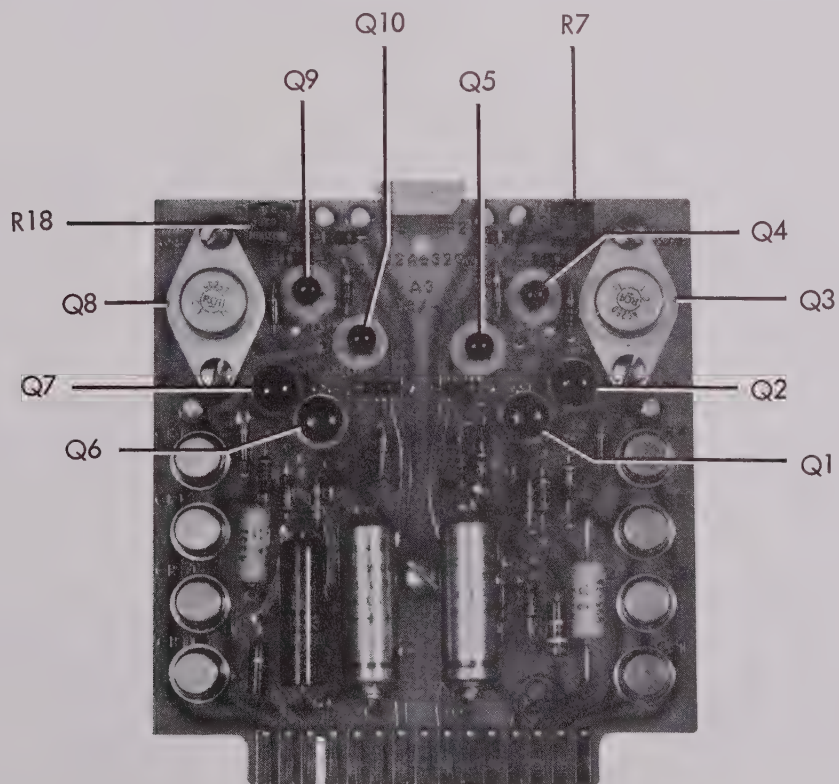


Figure 3-29. Board A3 -16 Volt Power Supply C02463200

C. FREQUENCY-SELECTIVE LEVEL METER

The Model 305A-L Frequency-Selective Level Meter measures the level of signals in the 1 kHz to 33.5 MHz range. See Figure 3-30 through 3-33 for views of the level meter.

The level meter receives three signals from the Model 305A-T Tuning unit and uses these signals as local oscillator frequencies to select the frequency to be measured. The level meter also sends the 21.0 to 21.1 MHz IF signal to the Model 360A Spectrum Display Unit, when used.

1. Functional Analysis

This analysis is separated into discussions of the functions of the signal input section, first IF section, second IF section, third IF section, filter section meter section, and audio section. See Figure 6-13 for the block diagram and Figures 6-14 through 6-15 schematic diagrams.

a. Signal Input Section

The function of the signal input section is to receive the unknown signal from the 75-ohm input line, to attenuate that signal as the operator desires, to match the input impedance to the impedance of successive stages, to filter out signals above 32 MHz, and to produce a stable internal 1 MHz calibration signal.

b. First IF Section

The function of the first IF section is to modulate the unknown frequency with the 40.1 to 72.1 MHz coarse tuning input signal, then to select the frequency difference between the two.

c. Second IF Section

The function of the second IF section is to modulate the first IF with the 19.0 MHz input signal from the tuning unit and to select the difference frequency. This section sends a 20.0-20.1 MHz signal to the Model 360A Spectrum Analyzer.

d. Third IF Section

The function of the third IF section is to modulate the second IF signal with the 18.785 to 18.885 Fine Tuning input from the tuning unit and to select the difference frequency.

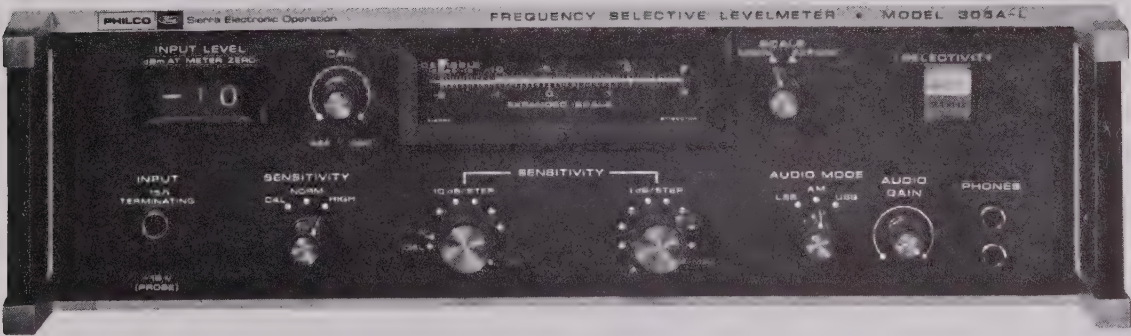


Figure 3-30. Frequency-Selective Level Meter, Model 305A-L

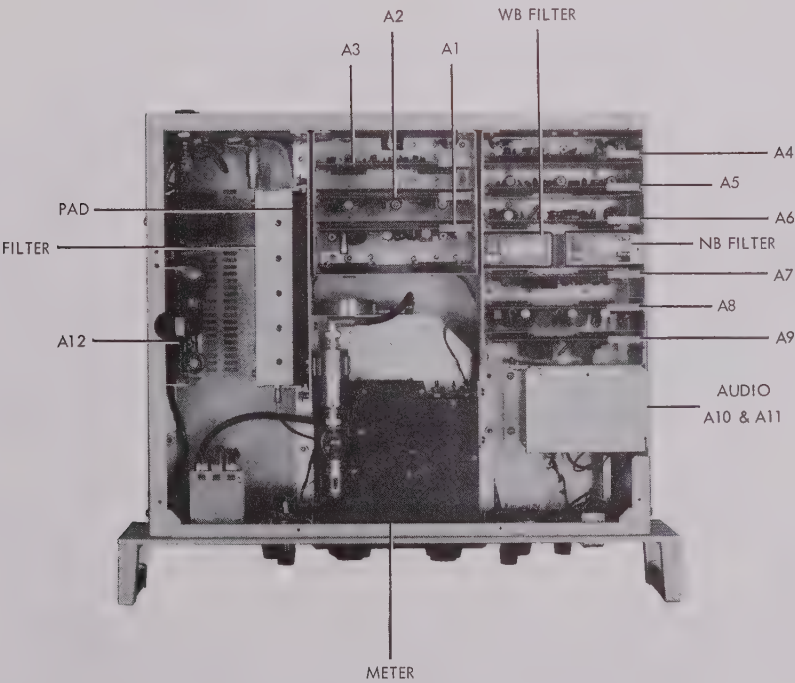


Figure 3-31. Model 305A-L Level Meter Top View

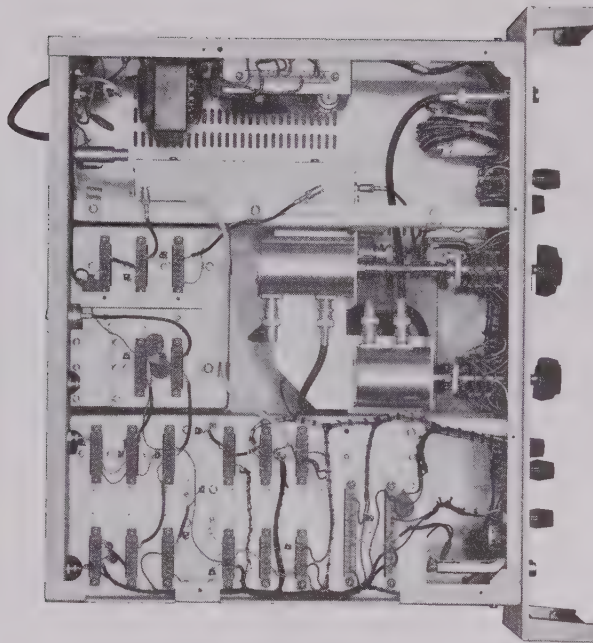


Figure 3-32. Model 305A-L Level Meter Bottom View



Figure 3-33. Model 305A-L Level Meter Back View

e. Filter Section

The function of the filter section is to filter out unwanted signals. The filter section also allows the operator to select either a narrow spectrum or a wide spectrum for display on the DECIBELS meter.

f. Meter Section

The function of the meter section is to amplify and rectify the signal from the filter section and to display the level of the resulting signal. This section also allows the operator to select a normal or an expanded meter scale.

g. Audio Section

The function of the audio section is to amplify and demodulate audio-frequency signals, including single sideband transmissions, so that these signals can be monitored.

2. Circuit Analysis

The frequency-selective level meter consists of six functional systems. See Figures 6-14 and 6-15 for the schematic diagram.

a. Signal Input Section

The signal input section consists of two attenuators, an attenuator display, an impedance-matching circuit, a low-pass filter and a gain reference oscillator.

The two attenuators are resistor networks that are set by the position of the SENSITIVITY Knobs on the front panel. As the input level decreases, the knobs select decreasing attenuation. The knobs also operate switches S1 and S2 which controls the dBm INPUT Display. The 1 dB knob has ten positions, allowing decreasing attenuation in 1 dB increments. The 10 dB knob has nine positions allowing decreasing attenuation in 10 dB increments. Switch S3 increases the gain of the meter amplifier by 20 dB. Input level between -109 dBm and +20 dBm can be measured by the use of these switches.

The input-matching circuit consists of two resistors, a capacitor and an inductor mounted within a metallic shield. See Figure 3-34 for component location.

The input low-pass filter filters out all frequencies above about 32 MHz. The filter consists of five tunable L-C sections. Essentially flat response is obtained by tuning these five sections correctly.

The gain reference oscillator, Q1-Q2, produces a highly-stable 1 MHz square wave signal that is suitable for routine level meter calibration. The level of this oscillator is stable to less than 0.1 dB at normal ambient temperatures. Placing SENSITIVITY Switch in CAL Position applies B minus power and turns-on the oscillator. See Figure 3-35 for component location.

b. First IF System

The first IF system consists of a local oscillator amplifier, board A3 (See Figure 3-36), and a first modulator and IF, Board A2 (See Figure 3-37).

The local oscillator amplifier receives the 40 to 72 MHz coarse tuning signal from the tuning unit, amplifies that signal through Q1, Q2 and Q3, and buffers the signal through emitter followers Q4 and Q5 to the first modulator and IF.

Transistors Q6 and Q7 send a degenerative feedback to the emitter of Q2. Capacitor C11 controls the level of the feedback, and thus controls the level of the board output.

The first modulator and IF modulates the unknown signal with the amplified coarse tuning signal in the ring modulator A1, Transistor Q1 then amplifies the output of the ring modulator and sends the signal through the first IF filter. The first IF filter is a steep-skirted band-pass filter with a very flat response between 40.0 and 40.1 MHz. The flatness of the response prevents change of gain over the bandwidth. This bandwidth is necessary in order to accommodate signals 50 kHz below and above the 100 kHz lock points of the tuning unit. Emitter-Follower Q2 buffers the first IF signal to the second IF section

c. Second IF System

The second IF system consists of a second modulator, Board A4 (See Figure 3-38), a second mixer, Board A5 (See Figure 3-39). The system receives the 19.0 MHz fixed-frequency signal from the tuning unit and sends the 20.0 to 20.1 MHz second IF signal to the third IF system and, when used, to the spectrum analyzer.

The 19.0 MHz signal from the tuning unit is amplified through Q1 and Q2. Inductor L2 adjusts to resonate with C5 at 19.0 MHz. Emitter-follower Q3 buffers the amplified signal to the modulator which varies the impedance of the emitter resistor of the second mixer. Potentiometer R14, C7 and C10 balance-out the 19.0 MHz signal.

The second mixer (Q1) and IF is tuned to the second IF thus it amplifies only the difference between the 19.0 MHz signal and the first IF signal. The

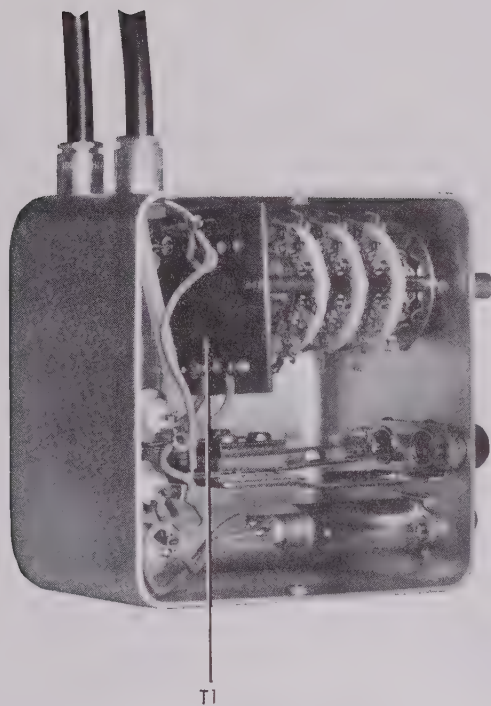


Figure 3-34. Input Matching Circuit

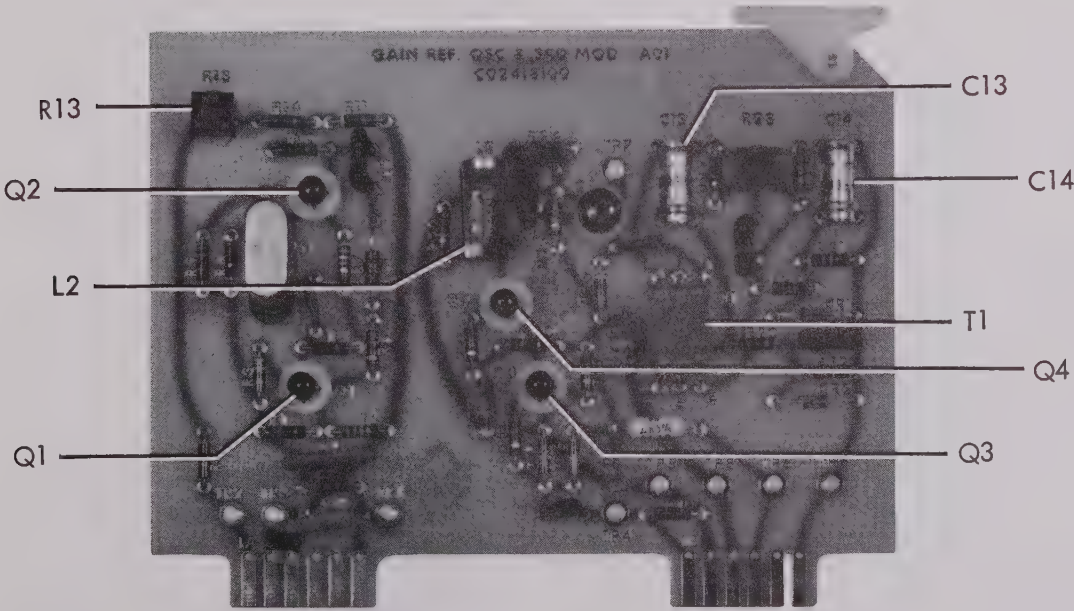


Figure 3-35. Board A1 Gain Reference Oscillator C02418100



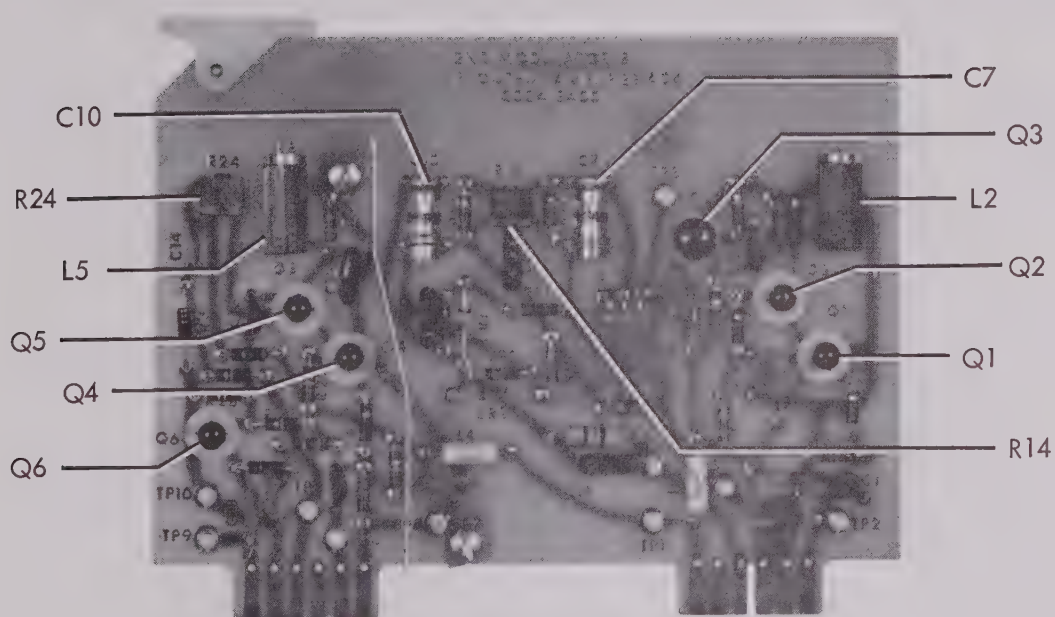


Figure 3-38. Board A4 Second Modulator and Output C02418400

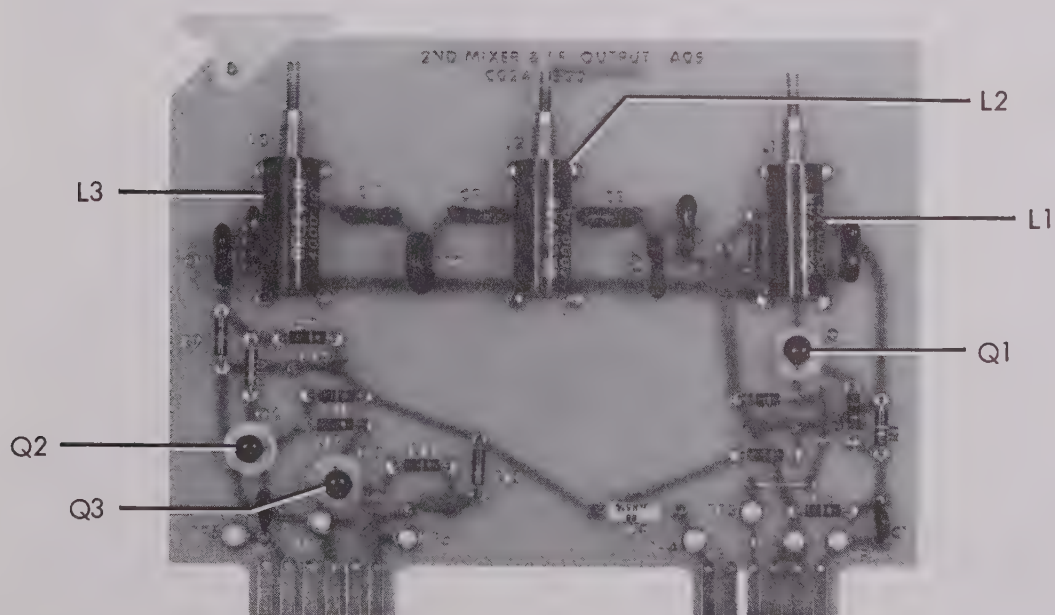


Figure 3-39. Board A5 Second Mixer and IF C02418500

second IF filter has a flat band-pass between 21.0 and 21.1 MHz. Transistor Q2 buffers the second IF to the second IF output amplifier and the base of Q3. Transistor Q3 buffers the second IF to the third IF system.

The second IF output amplifier buffers the second IF through Q4 to the base of Q5. The gain of Q5 is varied by switch S3 on the front panel. When switch S3 is in the HIGH position, 16 volts appears across R26, and CR3 shunts the rf signal at the emitter to ground, thus increasing the gain of that stage by 20 dB. Transistor Q6 buffers the amplified second IF signal to the spectrum display unit.

d. Third IF Section

The first IF section consists of a third modulator, Board A6 (See Figure 3-40) and a third mixer and IF

The operation of the third modulator and third mixer is quite similar to the operation and is almost identical to that of the second modulator and second mixer, except that the third modulator receives the 18.775 to 18.895 MHz fine tuning signal from the tuning unit and produces a 2.215 MHz third IF.

Transistor Q2 amplifies the third IF and sends it to Q3 and Q4.

SELECTIVITY Switch, when in the 3.1 kHz (green) condition, deenergizes K1, grounding the input of the narrow band filter.

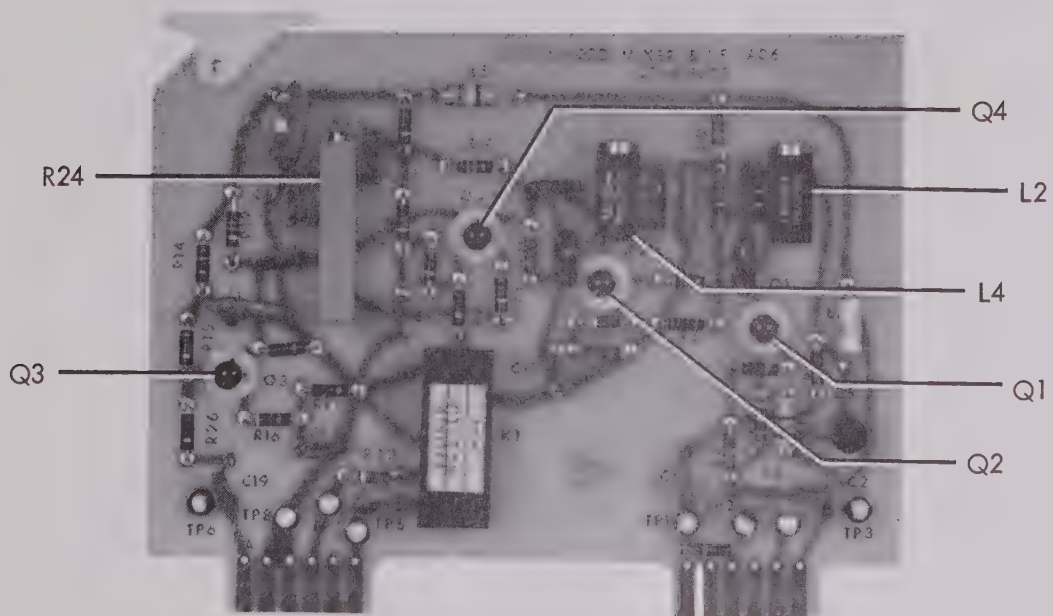
Transistor Q3 sends the signal through the wide band-pass filter. When K1 is energized, Q4 sends the signal through the narrow band-pass filter.

e. Filter Section

The Filter section consists of two crystal filters and a narrow band and wide band followers board A7 (See Figure 3-41).

The crystal filters determine the over-all selectivity of the instrument. Both filters have a band-pass centered at 2.215 MHz, but the narrow band-pass filter has a band-pass of 250 Hz, whereas the wide band-pass filter has a band pass of 3100 Hz.

Each filter sends the 2.215 MHz through an emitter-follower Q3. When SELECTIVITY Switch is in the 3.1 kHz condition, Relays K1 and K2 on Board A7 energize sending the 2.215 MHz from the wide band-pass filter to the meter section. When SELECTIVITY Switch is in the 250 Hz condition, relays K1 and K2 deenergize, sending the 2.215 MHz from the narrow band-pass filter through the contact, of K2 to the meter section.



At the customer's option, the output to the audio section may come from only the wide band-pass filter or from either filter.

f. Meter Section

The meter section consists of a meter amplifier Board A8 (See Figure 3-42), a meter circuit Board A9 (See Figure 3-43), a meter compensation Board A15 SCALE Switch and DECIBELS meter. The meter amplifier board consists of three tuned amplifier stages. When SENSITIVITY Switch is in CAL or NORM Position, the input signal is dropped over the voltage divider R1-R2, decreasing the gain of the board by 20 dB. When SENSITIVITY Switch is in HIGH Position, relay K1 energizes and applies the input signal directly to the base of Q1, thus increasing the gain of the board by 20 dB. CAL Potentiometer also controls the gain Q1.

The meter circuit board consists of a feedback-controlled amplifier Q1 an amplifier, Q2, a full-wave rectifier CR1-CR2 a feedback circuit C7-C8 an EXPANDED SCALE ADJUST Potentiometer R14 and recorder adjust Potentiometer R16. This board drives the DECIBELS Meter and an external recorder, when used.

The meter compensation board consists of a large capacitor across the meter and a temperature-compensating thermistor.

SCALE Switch on the front panel expands the scale of the meter to -2 dB to +2 dB coverage.

g. Audio Section

The audio section is comprised of an audio amplifier Board A11 (See Figure 3-44) and a sideband oscillator Board A10 (See Figure 3-45).

The audio amplifier receives the third IF signal from either filter emitter-follower on Board A7 (depending on optional strapping). Tuned amplifier Q1 amplifies the signal, then Q2 detects the audio signal. Transistor Q3 amplifies the audio signal and sends it through AUDIO GAIN Potentiometer, through two further stages of amplification, and to external earphones.

When AUDIO MODE Switch is in USB or LSB position, the applicable sideband oscillator activates and applies a signal 1500 Hz below or 1500 Hz above the third IF to the detector, Q2 of Board A11. Both oscillators are crystal-controlled and buffered.

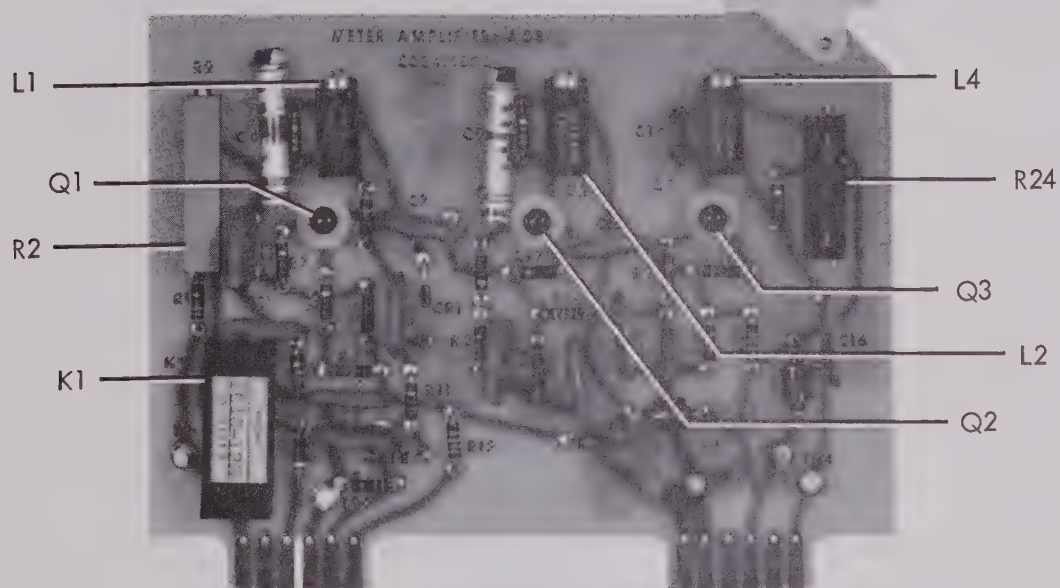


Figure 3-42. Board A8 Meter Amplifier C02418800

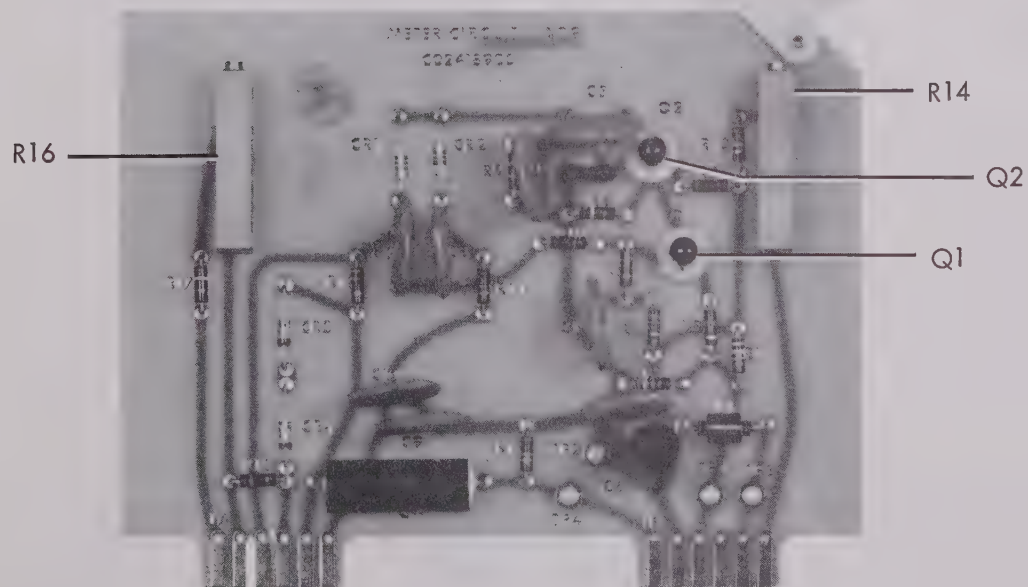


Figure 3-43. Board A9 Meter Circuit C02418900

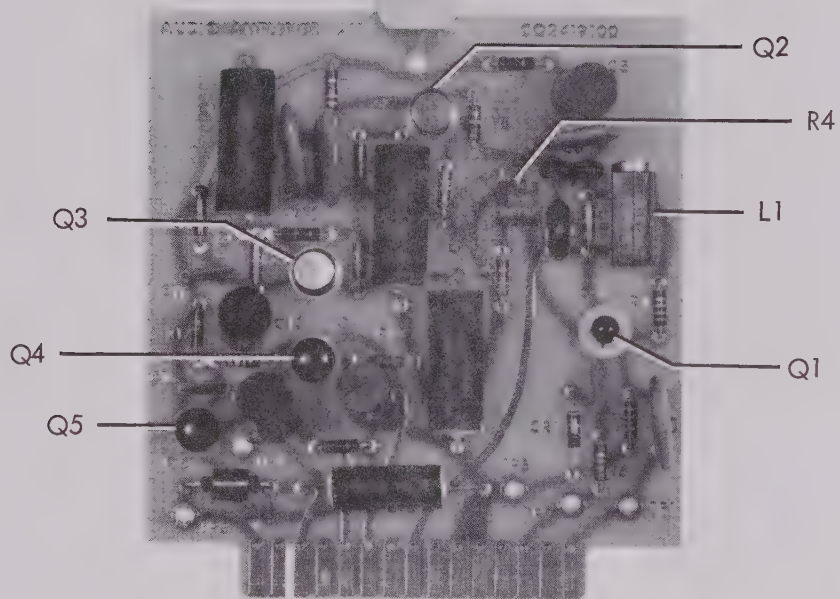


Figure 3-44. Board A11 Audio C02419100

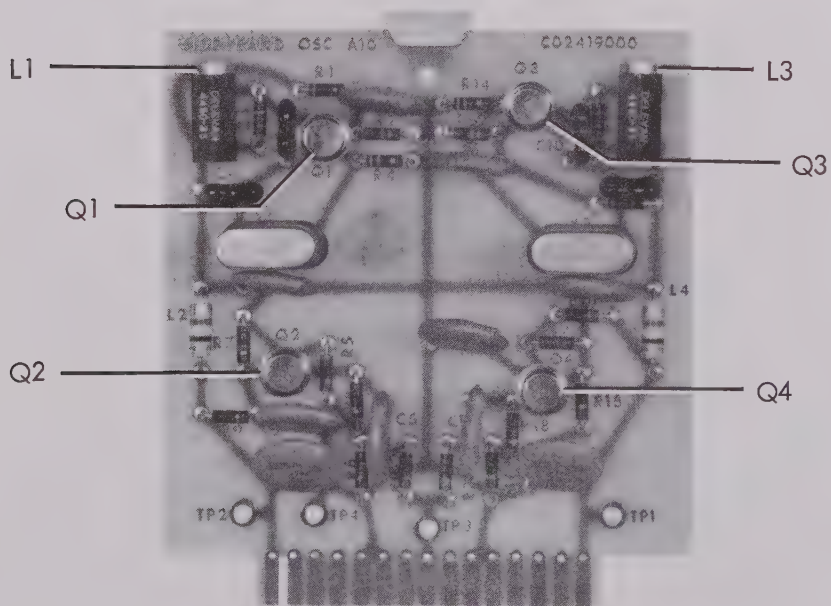


Figure 3-45. Board A10 Sideband C02419000

D. SIGNAL GENERATOR

Outputs from the Coarse and Fine Tuning sections of the Tuning Unit, when connected to the Model 305A-G Signal Generator inputs, combine to generate the required 1 kHz-32 MHz Signal output (See Figure 3-47 through 3-50 for views). See Figure 6-15 for the block diagram and 6-16 and 6-17 for the schematic diagrams.

1. Functional Description

The signal generator consists of a 21.215 MHz oscillator, a First Mixer, a Second Mixer, a 32 MHz Low-Pass Filter, a preamplifier output amplifier and thermistor bridge, an Automatic Level control, a DC Transfer Standard, a Relay Board, Output Attenuators, and Power Supplies.

2. Circuit Description

This paragraph describes the circuits of the signal generator.

a. 21.215 MHz Oscillator, Module A1. This is a precision crystal precision crystal oscillator contained in a temperature controlled oven, mounted as a plug-in unit. The oven operates from 115V ac, which is brought to the socket independently of the power ON-OFF switch, so that the oven is on whenever the ac cord is plugged into an ac source. The oscillator itself operates with -15V dc from the Generator power supply and is thus controlled by the Power ON-OFF switch.

b. First Mixer, Module A2. (See Figure 3-51) Inputs to the first mixer are brought in from the 21.215 MHz crystal oscillator and from the Fine Tuning output of the Tuning Unit.

The 21.215 MHz output is very lightly capacitively-coupled to the tuned RF transformer, T1 through C12. Injection level is set with R11 to about 25 mV. The signal is matched to the 50 ohm impedance of the encapsulated, balanced ring mixer, Z1.

The input from the tuning unit band pass is connected to a tuned amplifier, Q1-Q2. A gain control is the emitter circuit of this amplifier is used to set the injection voltage to approximately 1 volt rms. This signal is matched to the high-level input of Z1.

Output from the "I" connection of the Mixer is applied to a band-pass amplifier tuned to the sum of the two input frequencies. These circuits are tuned to 40.0-40.1 MHz to select the sum frequencies in the mixer output.

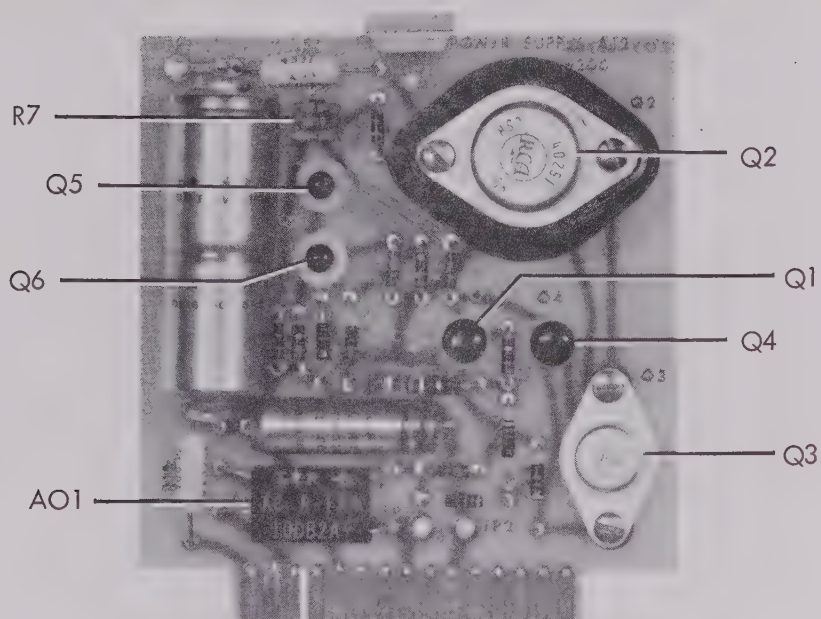


Figure 3-46. Board A12 Power Supply C02419200

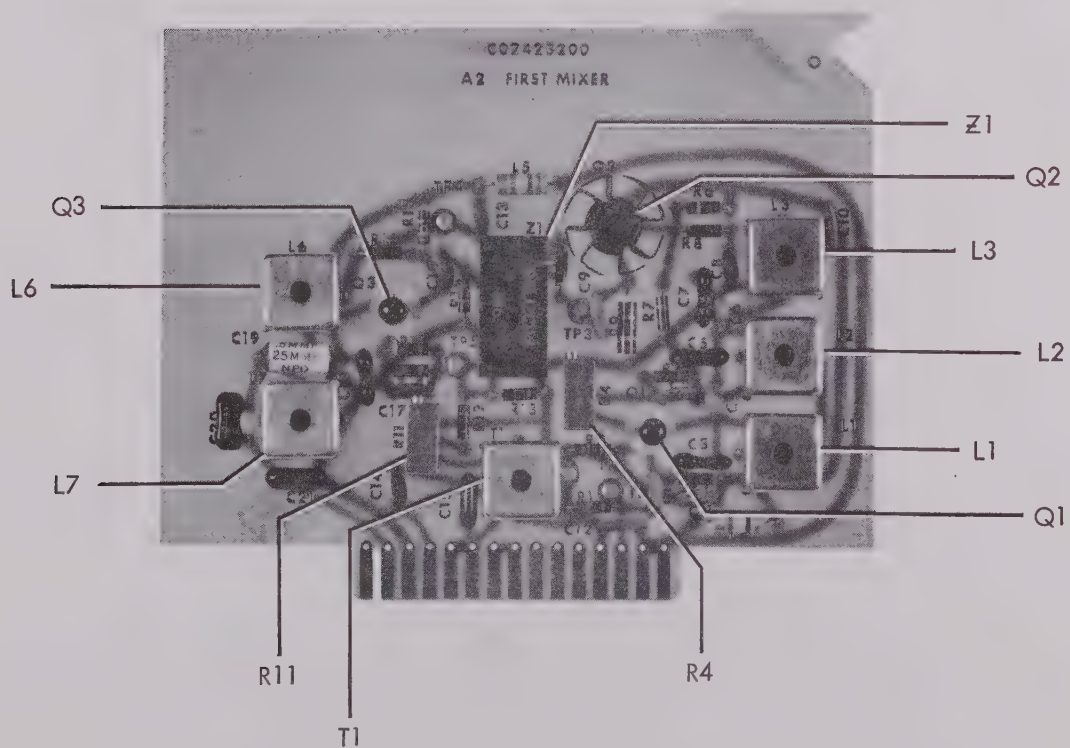


Figure 3-47. Board A2 First Mixer C02423200

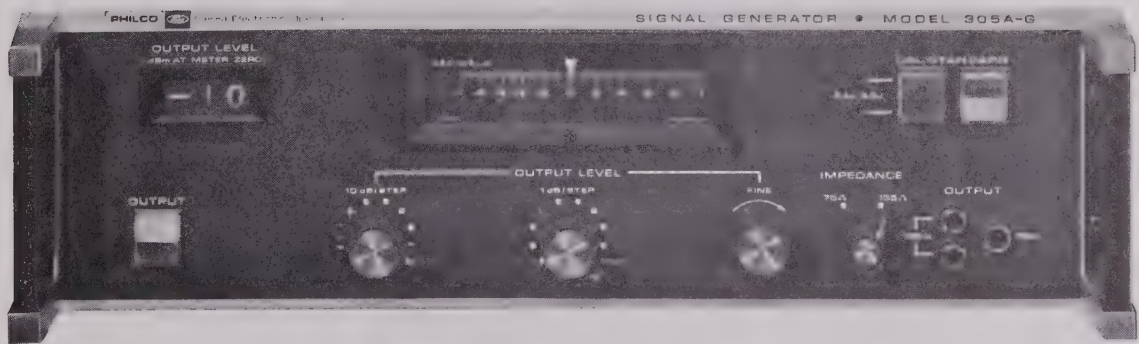


Figure 3-48. Model 305A-G Tracking Signal Generator

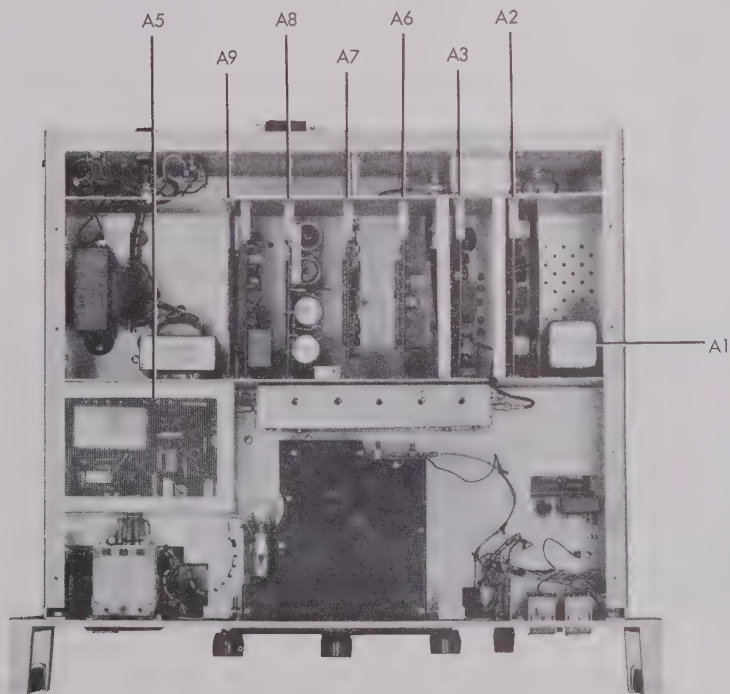


Figure 3-49. Model 305A-G Signal Generator Top View

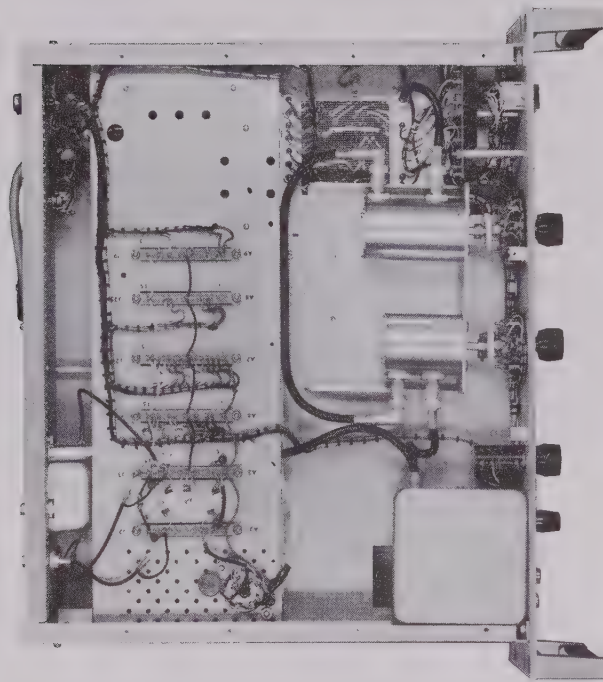


Figure 3-50. Model 305A-G Signal Generator Bottom View

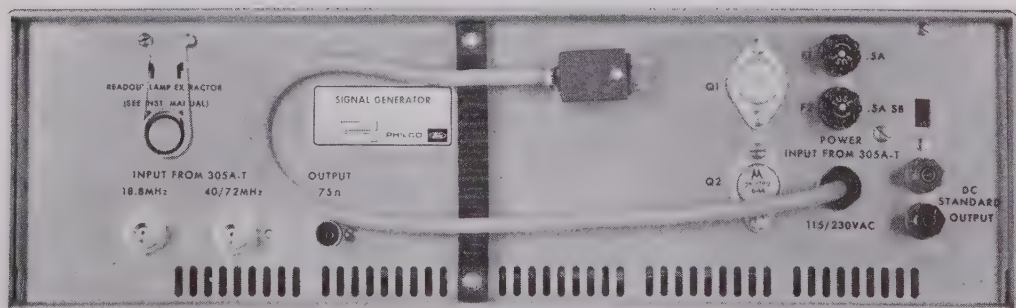


Figure 3-51. Model 305A-G Signal Generator, Back View

c. **Second Mixer, Module A3.** (See Figure 3-52) Output from the first mixer, at 40.0-40.1 MHz, is applied to a tuned amplifier, Q6. A level control in the emitter circuit of Q6 adjusts the injection level to the second mixer. Output impedance and level is reduced by the capacitive divider, C19, C20, and isolation furnished by the resistor network R28-R30. Together these components match the impedance to the 50 ohms required to match the input of the encapsulated, balanced mixer, Z2.

40-72 MHz output from the Tuning Unit Coarse Tuning section is brought in through a level controlled amplifier Q1-Q5 and Z1. Transistors Q1 and Q2 are stabilized with negative feedback and output from them is passed through isolating emitter-follower amplifier, Q5. One output from Q5 is matched to the 50 ohm input of the second mixer, Z2. The other output is used to provide automatic leveling control. This output is rectified with CR3, filtered by L3-C14 and applied to the inverting input of operational amplifier, Z1. Q4, a FET, acts as a variable resistance in parallel with the emitter resistor of Q2. Since this variable resistance, Q4 is controlled by the dc output of Z1, the gain of Q2 is controlled to provide a constant level to the mixer, Z2. Level is set by the adjustment of R20. CR2 permits dc bias to be applied to Q4 around the feedback resistor, R3, of the operational amplifier, Z1. Zener diode, CR1, reduces the +22V dc supply voltage to the +15 volts required by Z1.

d. **32 MHz Low-Pass Filter, A4.** (See Figure 3-53) Output from the second mixer is applied to the low-pass filter to remove all but the difference frequencies from the signal. These difference frequencies provide the desired range, 1 kHz-32 MHz, of the Signal Generator. To preserve the flat frequency response characteristic, determined by the leveling amplifier of the proceeding stages, the filter has been designed for a ripple of 0.1 dB or less in the pass band. The filter is isolated from the mixer output with a resistor network and the 50 ohm impedance is matched to the following amplifier. The matching resistor being located on module A5.

e. **Preamplifier, Power Amplifier and Thermistor Bridge, Module A5.** (See Figure 3-54) The low level output from the 32 MHz low-pass filter is amplified and the gain controlled in the two integrated circuit wide-band amplifiers, Z1 and Z2. Photo resistive units, CK2074, in the feedback circuits of these amplifiers control the gain. The control voltage comes from the ALC circuit on Module A6. Full Generator output power is delivered by emitter follower, Q3, to the output step attenuators and the impedance matching networks.

The input to the ALC circuits in Module A6 is the output of a thermistor bridge. Two legs of the bridge are indirectly heated thermistors. The resistance of the thermistors depends on the rf or dc power applied to the resistive heating element. One heater source is a very stable dc obtained

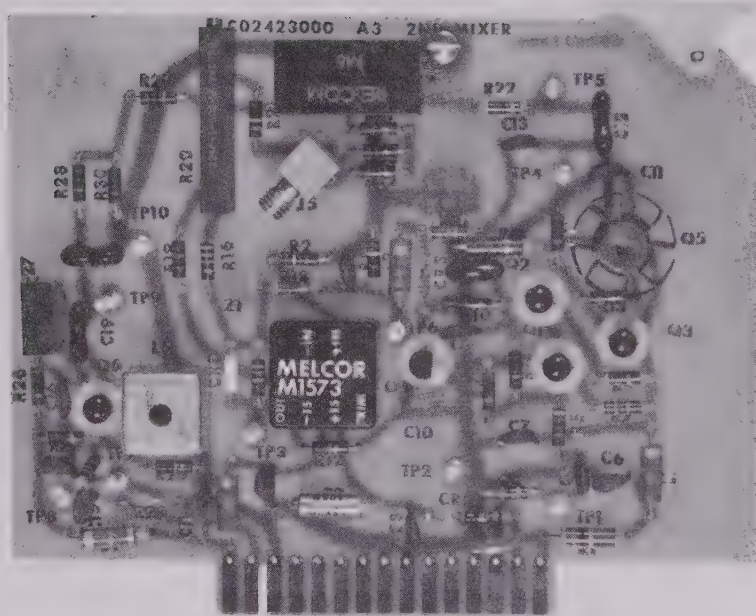


Figure 3-52. Second Mixer C02423000

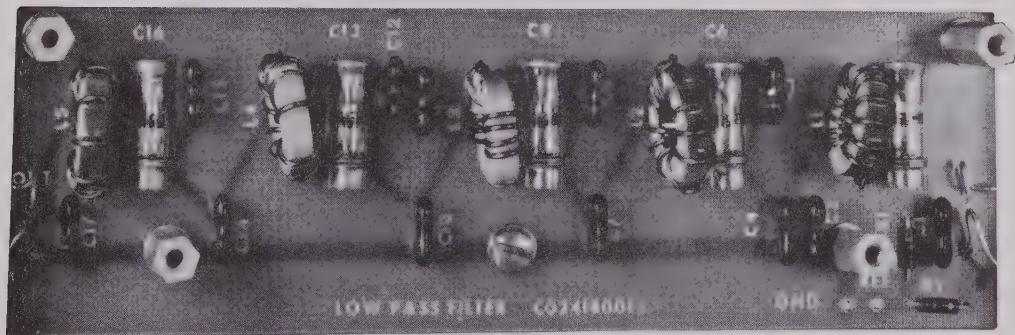


Figure 3-53. Board A4 32 MHz Low-Pass Filter

from the dc Transfer Standard, Module A9. This heater is connected to CAL ADJ potentiometer, R3, which is adjusted for bridge balance.

The other heater connection is controlled by the CAL STANDARD Switch S2 through relay K1. When the switch is in the OFF position the heater is connected to the RF Output signal for Automatic Level Control. When the switch is in the ON position the heater is connected to the dc Transfer Standard output for bridge and meter calibration.

f. Automatic Level Control, Module A6. (See Figure 3-55) The error signal from the thermistor bridge, due to changes in signal level, is amplified by the two operational amplifiers, Z1, Z2, and the output applied to the photoresistive controls in the preamplifier to provide the leveling function. In addition, metering and variable output level control are accomplished in this closed loop control circuit.

The bridge output is connected to the input of the differential amplifier, Z2. The bridge unbalance is thus amplified and applied to the meter through a calibrating resistor, R4. The output of Z2 is also connected to the inverting input of Z1 along with the voltage output from the FINE LEVEL control potentiometer, R13.

These outputs are summed in Z1 and the output applied to the base of Q1 which functions as a current booster to supply sufficient control power to the photoresistive controls in the feedback loops of the preamplifiers.

Gain of the preamplifiers is thus controlled both by the error voltage output of the thermistor bridge and by the setting of the FINE LEVEL control. The net effect is that the output is leveled at any output determined by the setting of the FINE LEVEL control. Output may be adjusted over the range of ± 1 dB by the FINE LEVEL control. Operational calibration of the thermistor bridge and the Output Level meter is accomplished with two very accurate dc voltages from the dc Transfer Standard. To make the calibration the CAL STANDARD switch S1 and S2 are placed in the ON and 0 positions. This operates relay K1 on the Module A5 to disconnect the signal arm-heater of the bridge from the signal output and connect it to the 0 dB output of the dc Transfer Standard through relay K1 (on Module A10). The bridge is then balanced (indicated by a 0 dB meter reading) by adjusting R6 (screwdriver adjustment next to 0 position on CAL STANDARD switch, S2). The CAL STANDARD switch, S3, is then placed in the +1 position and relay K1 (on Module A10) operates to connect the +1 dB output of the dc Transfer Standard to the signal arm-heater of the thermistor bridge. R3 (screwdriver adjustment) next to the +1 position on the CAL STANDARD switch, S2, is adjusted for a +1 dB reading on the Output Level meter.

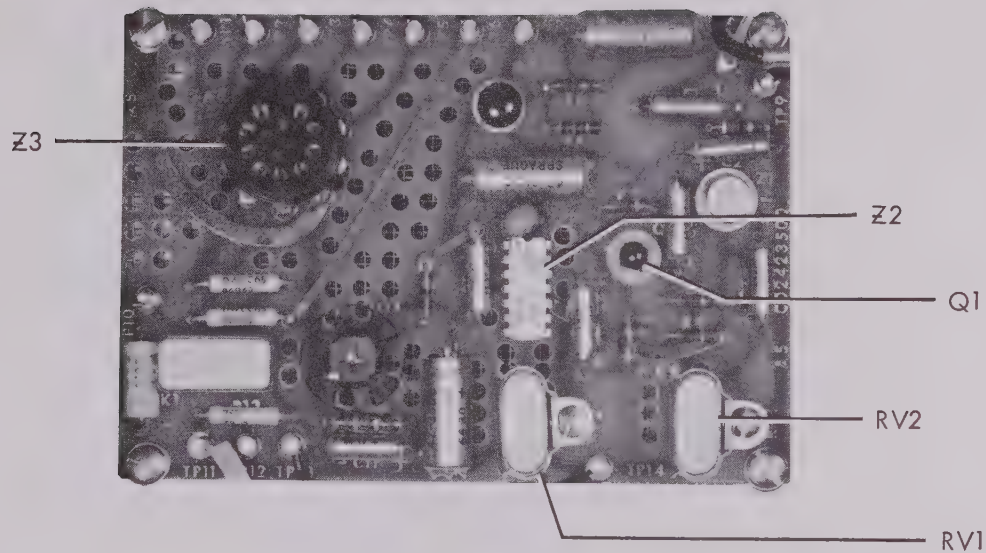


Figure 3-54. Board A5 Preamp. Power Amp. and Therm. Bridge C02423500

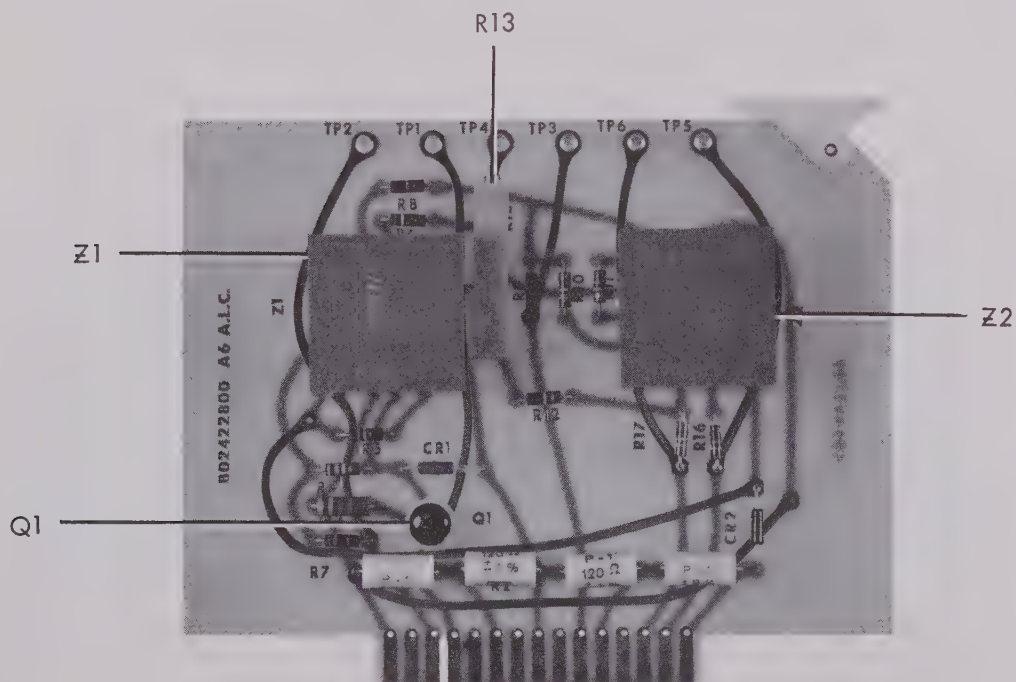


Figure 3-55. Board A6 Automatic Level Control C02422800

Signal output is turned off by depressing the OUTPUT switch, S3, to the OFF position. This removes dc power from the Preamplifier Power Amplifier Module A5. At the same time relay K1 (on A5) transfers the signal arm heater of the bridge to the 0 dBm output of the dc Transfer Standard so that the meter will rest in the 0 dB position. The CAL STANDARD switch, S2, is interlocked with the OUTPUT control so that whenever CAL STANDARD switch, S3, is depressed to the ON position the power is automatically removed from the Preamplifier-Power Amplifier Module, A5, and the OUTPUT switch indicator light gives on the OFF indication. The digital attenuator readout is turned off when signal is off.

g. DC Transfer Standard, Module A9. (See Figure 3-56) The dc Transfer Standard is made up of a temperature compensated zener reference diode with a very accurate resistor network to make three accurately known voltages available.

The dc Transfer Standard is calibrated by adjusting the STD CELL OUTPUT voltage to 1.0192 volts dc with R6 (Set). When this is done the +1 and 0 outputs to the bridge are accurately set by the precision resistor network.

The Standard Cell voltage output of the dc Transfer Standard may now itself be used as a secondary standard since this voltage will be accurately maintained by the very good long term stability of the zener reference diode. In using this voltage, to maintain accuracy with ± 0.1 dB, the load on the output must be no less than 500K ohms.

The other two outputs of the Transfer Standard, used to balance the thermistor bridge and calibrate the meter, are connected to the bridge by relay switching when the CAL STANDARD switch is depressed. The unused output is automatically connected to an equivalent resistance to prevent any change in the load placed on the Transfer Standard.

h. Relay Board, Module A10. (See Figure 3-57) This board contains two of the relays used in the Output Calibration switching functions. One relay, K1, connects the proper output from the dc Transfer Standard to the thermistor bridge relay contact. The other relay controls part of the Output-Calibration indicator light functions. The thermistor bridge relay is mounted on board A5 so that the rf lead connected to it will be of minimum length.

i. Output Attenuators and Impedance Matching. The signal output from the power amplifier passes through two 75 ohm step attenuators directly to the 75 ohm output and through a matching transformer to the 135 ohm output. The 10 dB/step and 1 dB/step attenuators are connected in series to give the full output range of -90 dBm to +1 dBm. The continuously variable FINE adjustment makes possible a setting at any level in this range, the output level being the

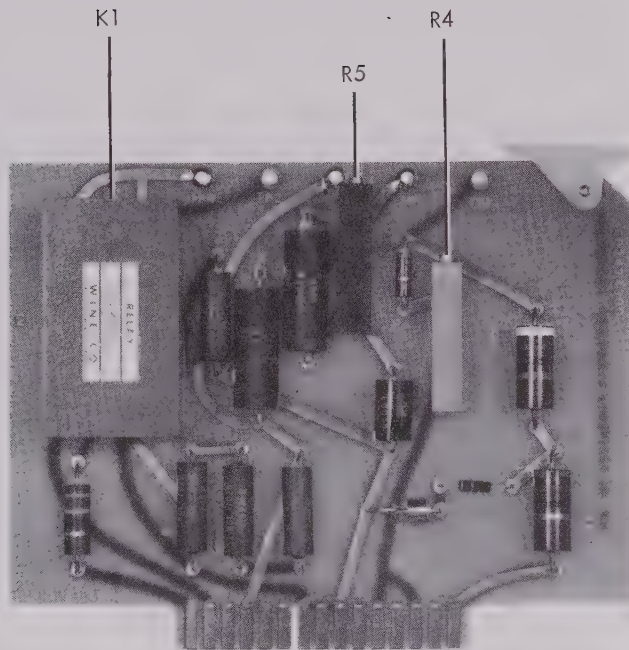


Figure 3-56. DC Reference Standard C02424300

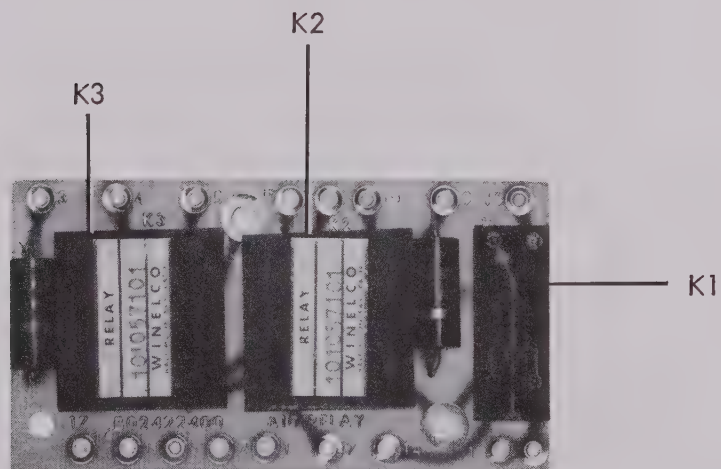


Figure 3-57. Board A10 Relay Board B02422400

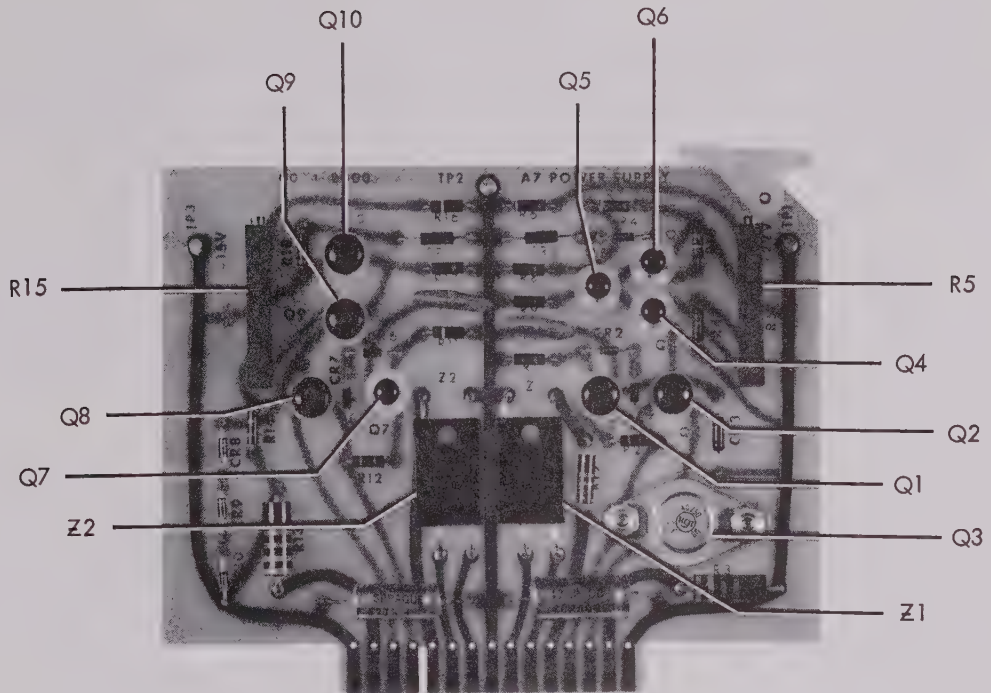


Figure 3-58. Board A7 Power Supply Regulators C02422600

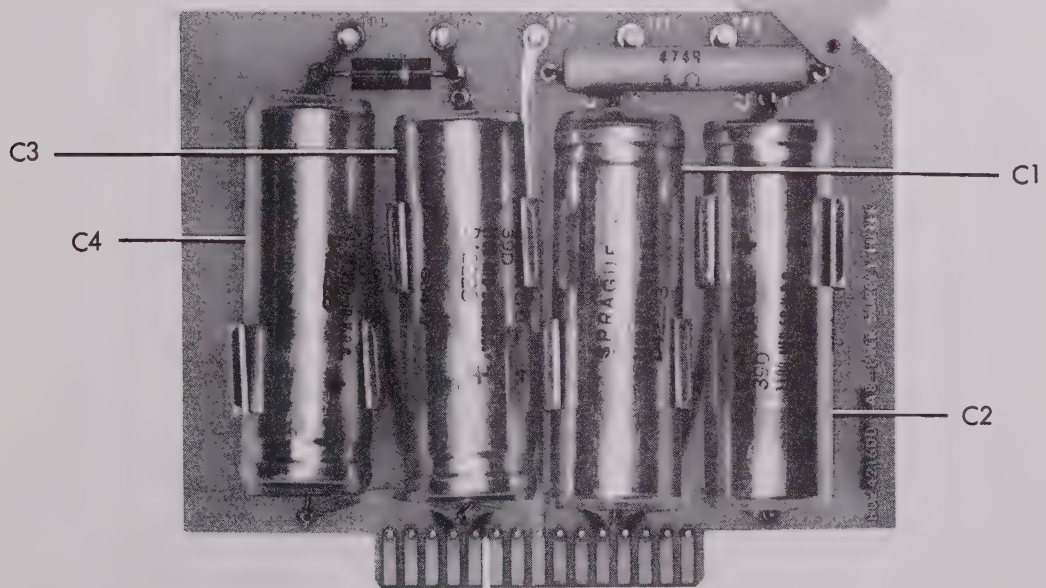


Figure 3-59. Board A8 Power Supply Filters C02416000

algebraic sum of the step attenuator settings and the meter reading. The total of the two attenuator settings, expressed in dB and referenced to zero dB, is displayed on a light operated numeric readout. The readout device is controlled by switches connected to the Attenuator adjustment shafts.

The 75 ohm output is connected to a 75 ohm Western Electric type coaxial jack on the front or the rear panel. Connection to either the front or rear panel jack is made with a coaxial patch plug inside the chassis. The signal is also controlled by the IMPEDANCE switch. The 135 ohm impedance is obtained by switching in an impedance matching transformer and available at a telephone type double phone jack.

j. Power Supply, Regulator and Filters, Modules A7, A8. Two secondaries of the power transformer, T1, are connected to the bridge rectifier units, CR1 and CR7, on Module A7 (See Figure 3-58) to furnish the required +22V and -15V dc. Output of the rectifiers is first filtered in the R-C low-pass Power Supply Filter. Module A8 (See Figure 3-59) and the passed through the Power Supply Regulators on Module A7.

The series regulator transistors for both the +22V and -15V supplies are mounted on the chassis in order to provide them with a suitable heat sink. Q1 is the control amplifier for input voltage variations and Q4, Q5, Q6 for output voltage variations, CR5 is the voltage reference zener diode for the 22V supply. The output of these amplifiers is applied to the compound connected amplifiers, Q1, Q2 which control the series regulator. The Output current is limited to 600 mA by R3 and CR3. In the -15V supply the control amplifiers are Q7, Q9, Q10, the voltage reference diode is CR11, the series regulator amplifier is Q8 and the current limiting function is performed by R13, CR10.

SECTION IV

MAINTENANCE

A. SCOPE

This section contains three other subsections. These are Checkout Procedure, Troubleshooting and Alignment and Adjustment.

B. CHECKOUT PROCEDURE

This subsection is separated into four paragraphs. The first paragraph details the checkout of the tuning unit. The second paragraph details the checkout of the level meter. The third paragraph details the checkout of the Signal Generator, and the fourth paragraph details the checkout of the transmission measuring set. Each unit should be checked-out every three months.

1. Tuning Unit

The check-out of the tuning unit requires the following equipment or equivalent.

Frequency Counter	Hewlett-Packard HP524C
RF Microvoltmeter	Millivac MV28B
AC Vacuum Tube Voltmeter	Hewlett-Packard HP400L

Since the tuning unit is always used with the level meter and the signal generator, it must be checked-out before checking out the companion equipment.

To check the tuning unit, proceed as follows:

- a. Verify that LINE SELECTOR Switch is in the proper position.
- b. Install the power cord in a power receptacle, and wait three hours.
- c. With an ac Vacuum Tube Voltmeter, verify that power is available at pins B and C of Jacks J2, J3 and J4 on the back of the instrument.
- d. Operate POWER switch to the ON condition. Verify that POWER Switch illuminates green.

- e. Press TUNING MODE switch twice. Verify that CONT and LOCK portions of that switch alternately light.
- f. With an ac vacuum tube voltmeter, verify that ac power is available between pins A and C on Jack J3.
- g. Operate TUNING MODE switch to the LOCK state.
- h. Rotate FINE TUNING control counterclockwise. Verify that FREQUENCY Display indicates decreasing frequency. As the control approaches the counterclockwise stop, verify that kHz LOW indicator lights. Adjust the control for a 3000 indication in the last five places of FREQUENCY Indicator.
- i. With an rf microvoltmeter equipped with a 50 ohm probe verify 210 to 270 millivolts at Jack J8.
- j. With an rf microvoltmeter equipped with a 50 ohm probe, verify a 210 to 270 millivolts at Jack J10.
- k. With an rf microvoltmeter equipped with a 50 ohm probe, verify 70 to 110 millivolts at Jack J11.
- l. With an RF microvoltmeter equipped with a 50 ohm probe, verify 75 to 115 millivolts at Jack J6.
- m. With a frequency counter, verify 19,894,990 to 18,895,010 Hz at Jack J8, J10 and J11.
- n. With a frequency counter, verify 18,999,990 to 19,000,010 Hz at Jack J6.
- o. Verify that the last four digits on the FREQUENCY Displays are zeros.
- p. Tune FINE TUNING Control clockwise until the FREQUENCY meter indicates 100 kHz.
- q. Verify that kHz HIGH indicator is lit.
- r. Repeat steps i through l, then repeat step n.
- s. With a frequency counter at Jacks J8, J10 and J11. Verify 18,784,990 to 18,785,010 Hz.

- t. Adjust COARSE TUNING and FINE TUNING Controls counterclockwise until FREQUENCY Indicator indicates all zeros. Verify that MHz LOW Indicator lights.
- u. With an rf microvolt meter equipped with a 50 ohm probe, verify 85 to 165 millivolts at Jack J7.
- v. With an rf microvolt meter equipped with a 50 ohm probe, verify 190 to 270 millivolts at Jack J9.
- w. With a frequency counter, verify 40,00099,990 to 40,100,010 Hz at Jacks J7 and J9.
- x. Tune COARSE TUNING control clockwise for a 1.0 MHz indication on FREQUENCY Indicator.
- y. With a frequency counter, verify 41,099,990 to 41,100,010 Hz at Jacks J7 and J9.
- z. With an rf microvolt meter equipped with a 50 ohm probe, verify 115 to 135 millivolts at Jack J7 and 200 to 260 millivolts at Jack J9.
- aa. Leaving the microvolt meter at Jack J9, slowly adjust COARSE TUNING Control until the FREQUENCY Indicator indicates 32.0 MHz, stopping at each lock point. Verify that the microvolt meter does not vary more than 40 millivolts from the reading observed in step z.
- bb. Move the microvolt meter to Jack J7. Repeat step aa.

2. Level Meter

The checkout procedure for the level meter-tuning unit combination requires the following equipment or equivalent.

RF Signal Generator	Hewlett-Packard HP606A
Audio Oscillator	Hewlett-Packard HP200CD
75-Ohm Terminated Coaxial Cable	
Headphones	600 Ohm

This procedure assumes prior checkout of the tuning unit. To check out this equipment, proceed as follows:

- a. Turn-on equipment in accordance with Section II of this manual.

- b. Set the following controls:

SENSITIVITY	to	NORM
SCALE	to	NORM
SELECTIVITY	to	NARROW
TUNING MODE	to	LOCK
SENSITIVITY	to	0 dB

- c. Verify the following indications.

FREQUENCY METER	All digits lit
POWER Switch	Lit
TUNING MODE Switch	LOCK lit
INPUT LEVEL	0
SELECTIVITY SWITCH	NARROW lit

- d. Adjust the RF Signal Generator for a 1 MHz sine wave. Adjust the attenuator for a 0 dBm output.

- e. Connect the output of the Signal Generator through a 75-ohm coaxial cable to INPUT Jack on the panel.

- f. Set SCALE Control to EXPAND position.

- g. Adjust CAL control for a 0 dB indication on the level meter, then remove input.

- h. Set SENSITIVITY switch to CAL position.

- i. Adjust Tuning Unit COARSE TUNING and FINE TUNING controls for a peak reading on the level meter (peak frequency will be approximately 1 MHz). Peak reading should be 0 dB. If this reading cannot be obtained, adjust REF OSC screwdriver adjustment and repeat steps d through i.

- j. Sequentially adjust the signal generator for 0 dBm signal at 10 kHz, 100 kHz, 10 MHz, 20 MHz, and 32 MHz. At each frequency, peak the tuning unit. At each frequency, attenuate the signal on the signal generator in 1 dB steps to 9 dB. Make a corresponding adjustment on the level meter. At each increment observe the meter. The meter shall not deviate more than 0.2 dB from 0 indication. At each frequency, increases the signal attenuation in 10 dB steps, making corresponding adjustments on the level meter. The meter shall not deviate more than 0.2 dB from 0 dB indication, up to 80 dB.

- k. Disconnect the signal generator and connect an audio signal generator set for 1 dBm at 10 kHz.

- l. Peak the tuning unit; set AUDIO GAIN control fully CCW. Set AUDIO MODE switch to AM position. Plug earphone terminals into PHONES Jack and carefully adjust AUDIO GAIN control for a tone.
- m. Sequentially position AUDIO MODE switch to LSB and USB position. A tone shall be audible in each position.
- n. Disconnect audio generator.
- o. Press TUNING MODE switch. LOCK portion of switch shall darken and CONT portion shall light. FREQUENCY meter shall darken and kHz LOW indicator shall light.
- p. Adjust COARSE TUNING control clockwise. The first three digits of FREQUENCY meter shall light.
- q. Deenergize equipment.

3. Signal Generator

This checkout procedure assumes that the Model 305A-T has been previously checked in accordance with paragraph IV. B. 1. and assumes that the signal generator is properly connected to the tuning unit.

The checkout requires the following equipment, or equivalent.

FREQUENCY COUNTER	Hewlett-Packard HP524C
FREQUENCY-SELECTIVE LEVEL METER	Sierra Model 305A-L
DIFFERENTIAL VOLTMETER	Fluke 801

To checkout the signal generator, proceed as follows:

- a. Verify that both LINE SELECTOR Switches are in the correct position, then connect the power plug of the tuning unit to a suitable source of power. Wait three hours.
- b. At the signal generator, set the OUTPUT Switch to the OFF state.
- c. Operate POWER Switch on the tuning unit to the ON condition. Verify that OUTPUT Switch OFF indicator is lit.

NOTE: The DECIBELS meter may momentarily indicate maximum output.

- d. Rotate the 1 dB OUTPUT LEVEL Switch through its range. Verify a corresponding indication on OUTPUT LEVEL Indicator.

- e. Rotate the 10 dB OUTPUT LEVEL Switch through its range. Verify a corresponding indication on OUTPUT LEVEL Indicator.
- f. Operate CAL STANDARD to the ON condition. Verify that the ON indicator lights.
- g. With a differential voltmeter, at the DC REFERENCE OUTPUT binding posts at the back of the signal generator, verify 1.0188 to 1.0194 volts dc.
- h. Operate the CAL STANDARD 0/+1 switch to the 0 condition. Wait thirty seconds. Verify that the DECIBELS METER indicates -0.02 to +0.02 dB.
- i. Operate CAL STANDARD 0/+1 switch to the +1 condition. Wait thirty seconds. Verify that the DECIBELS Meter indicates +0.98 to +1.02 dB.
- j. With a 75-ohm coaxial cable, connect the output of the signal generator to the input of a frequency meter. Set IMPEDANCE Switch to the 75 Ω position.
- k. Operate TRACKING MODE switch on the tuning unit to the TRACK state, and adjust FINE TUNING and COARSE TUNING Controls for an 1.00000 MHz indication on the FREQUENCY meter.
- l. At the frequency counter, verify 999,990 to 1,000,010 Hz.
- m. Adjust FINE TUNING Control for a 1.10000 MHz indication on the FREQUENCY Indicator. Verify that the frequency counter follows ± 10 Hz. Return FINE TUNING Control to a 1.00000 MHz indication.
- n. Operate TRACKING MODE Switch to the LOCK state.
- o. Tune COARSE TUNING Control over the range of 100 kHz to 32 MHz. Verify that at each lock point the frequency counter indicates within 10 Hz of the indication on the FREQUENCY Indicator. Operate OUTPUT switch to the OFF condition.
- p. Terminate the output of the signal generator with a 75-ohm non-inductive resistor, and connect an rf microvolt meter with a high-impedance probe across this resistor. The frequency response of the microvolt meter must be known and the accuracy certified.
- q. Adjust the tuning unit for 1 MHz. The OUTPUT LEVEL Switches and fine control for zero and operate OUTPUT switch to the ON condition. Verify a 0.274-volt indication on the microvolt meter.

- r. Operate TRACKING MODE switch to the LOCK condition.
- s. Keeping in mind the response curve of the microvolt meter, tune the tuning unit from 1 kHz to 20 MHz. Verify that the frequency-corrected response of the microvolt meter does not deviate more than 0.1 dB from the level noted in step r.
- t. Tune the tuning unit to 32.1 MHz. Verify that the response of the microvolt meter does not deviate more than 0.2 dB from the indication noted in step r.

4. Model 305A Transmission Measuring Set

To check the Model 305A Transmission Measuring Set, proceed as follows:

- a. Perform IV. B. 1.
- b. Connect the three units as a set.
- c. Verify that all three LINE SELECTOR Switches are in the proper position and install the power plug in a power source. Wait three hours.
- d. Operate OUTPUT switch on the signal generator to the OFF state, and set POWER switch on the tuning unit to the ON state.
- e. Set SELECTIVITY switch to the CAL position, and tune the tuning unit to approximately 1.0 MHz.
- f. Operate SELECTIVITY switch to the NB condition.
- g. With the FINE TUNING Control obtain a maximum indication on the DECIBELS Meter of the Level meter.
- h. Adjust CAL control for a 0 dB indication on the DECIBELS meter.
- i. Set SCALE switch to the EXPAND position. Verify that the meter indicates 0 dB.
- j. At the signal generator operate the CAL STANDARD ON-OFF switch to the ON condition. Operate the CAL STANDARD 0/+1 dB switch to the 0 condition. Verify a -0.1 to +0.1 indication on the DECIBELS Meter on the Signal Generator.

- k. Operate the CAL STANDARD 0/+1 dB switch to the +1 dB condition. Verify a +0.9 to +1.1 indication on the DECIBELS Meter. Operate CAL STANDARD-ON switch to OFF.
- l. At the signal generator, set IMPEDANCE switch to the 75 Ω position. Connect a 75-ohm coaxial cable from the output of the signal generator to the input of the level meter.
- m. Set attenuator switches to 0, and operate OUTPUT switch to the ON condition.
- n. At the level meter set the SENSITIVITY switch to NORMAL position. Verify a -0.1 to +0.1 indication on the DECIBELS Meter.
- o. Operate the TUNING MODE switch to the LOCK condition.
- p. Slowly tune the tuning unit from 1 kHz to 22 MHz. Verify that the DECIBELS Meter does not vary more than 0.1 dB from a 0 dB indication.
- q. Slowly tune the tuning unit from 22 MHz to 32.1 MHz. Verify that the DECIBELS Meter does not vary more than 0.2 dB from a 0 dB indication.
- r. Sequentially in 1 dB steps, increase the output attenuation of the signal generator from 00 to -0.9 indication on OUTPUT LEVEL indicator. At each setting cause the INPUT LEVEL Indicator of the level meter to coincide. Verify that DECIBELS Meter does not deviate more than 0.1 dB from a 0 dB indication.
- s. Set the 1 dB attenuators back to 0 dB. Sequentially, in 10 dB steps, increase the output attenuation of the signal generator from a 0 to a -80 dB indication on OUTPUT LEVEL Indicator. At each setting cause the INPUT LEVEL Indicator of the level meter to coincide. Verify that DECIBELS Meter does not deviate more than 0.1 dB from a 0 dB indication.

C. TROUBLESHOOTING PROCEDURE

This subsection consists of listing common troubles that may be recognized and rectified by a relatively untrained operator. For the more serious problems, a trained electronic technician should employ conventional troubleshooting techniques with the aid of applicable schematic diagrams and block diagrams.

1. Lamp Replacement

To replace the lamps proceed as follows:

- a. DECIBELS Meters. The lamps for the DECIBELS meters are accessible immediately that the top cover is removed.
- b. Pushbutton Lamps. To replace the pushbutton lamps, remove the top cover; on the sides of the pushbutton switches you will observe holes covered on the inside by thin pieces of metal. With a scribe in the hole on the metal strip, move the metal strip either up or down. When the hole is uncovered, the faulty lamp will pop out. Replace the bulb, and, keeping pressure on the bulb, reposition the metal strip.
- c. Readout Lamps. To replace the readout lamps, remove one screw from the front bezel. Loosen the other. With the special tool on the back panel of the tuning unit or generator, engage the horizontal slots in the affected display and pull straight out. Operate the top and bottom snap springs and remove the front frame. The eleven bulbs are then accessible.

2. Tuning Unit

Since the Model 305A-T Tuning Unit controls the other two units, the outputs of the tuning unit should be verified prior to troubleshooting either of the other two modules. Table 4-1 lists common troubles and immediate action to be taken when troubleshooting the tuning unit.

TABLE 4-1 COMMON TUNING UNIT TROUBLES

Symptom	Probable Cause	Immediate Action
No Lights or Display	Improper connection or short circuit in 305A-T or 305A-G	Check power plug. Check main fuse F1
	305A-T Fuse Blown	Check fuse F2
Display on but no power ON on mode indicator lights	Power ON lamp burned out	Push mode switch to CONT position - CONT lamp should be ON - replace power ON lamp.

TABLE 4-1 COMMON TUNING UNIT TROUBELS (Continued)

Symptom	Probable Cause	Immediate Action
Display and power ON o.k. but mode indicator light out.	Mode lamp burned out	Push mode switch to CONT if lamp does not light replace lamp.
	Fine tune oscillator out of lock.	Check by pushing mode switch to CONT position.
One or more Display digets out, all else appears normal.	Burned out Display lamp	Remove Display Bezel and replace lamp.
One or more Display digets out and Coarse or Fine Tuning Knob have no effect. Display erratic	Counter lock-up	Check Figure 4-1
Loose feeling of tuning knobs – improper flywheel action	Loose flywheel set-screws	Tighten set-screws
Lights appear dim	Line voltage selector switch	Check for correct position

3. Frequency- Selective Level Meter

Table 4-2 lists troubles that an untrained operator can recognize and repair. Table 4-3 lists indications that major adjustment is required. In case of major troubles, verify the outputs of the tuning unit before major troubleshooting effort.

TABLE 4-2 LEVEL METER TROUBLESHOOTING CHART

Symptom	Probable Cause	Immediate Action
No light or display	Improper Connection	Check connection. Check power-plug
	Fuse F1 Blown	Replace Fuse F1

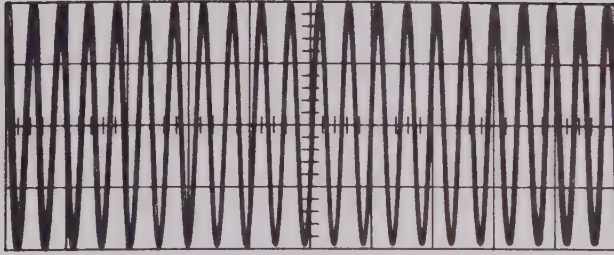


Figure a

Vert: 0.2V/cm
Horz: 0.05 μ s/cm

J28-2

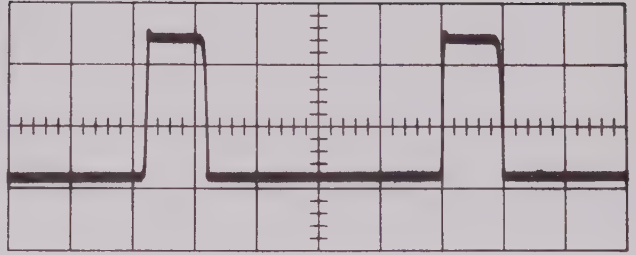


Figure b

Vert: 1V/cm
Horz: 0.5 μ s/cm

J30-15, 18

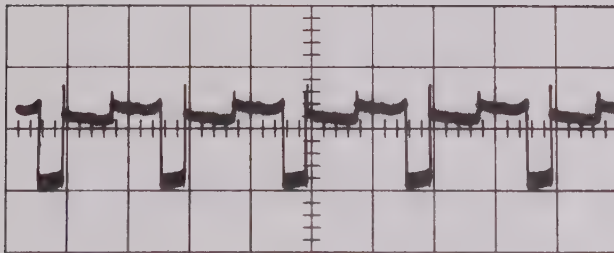


Figure c

Vert: 0.5V/cm
Horz: 5 μ sec/cm

J30-3

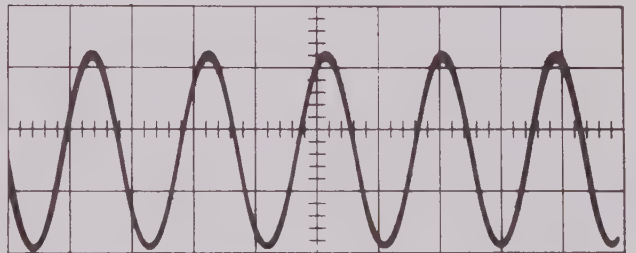


Figure d

Vert: 0.5V/cm
Horz: 2 μ s/cm

J30-16

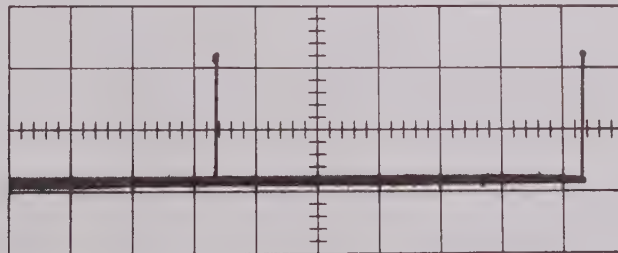


Figure e

Vert: 0.5V/cm
Horz: 20 msec/cm

J31-21, 22

Figure 4-1. Counter Waveforms

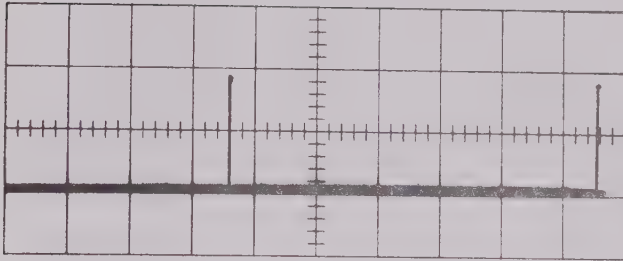


Figure f

Vert: 1V/cm
Horz: 20 msec/cm

J31-15, 16

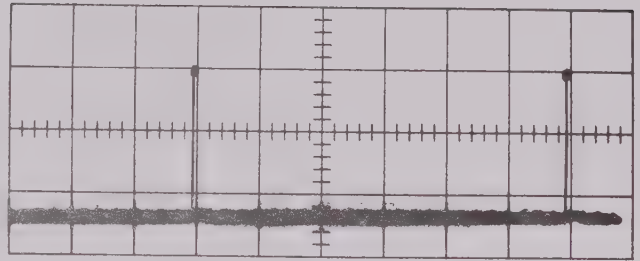


Figure g

Vert: 0.5V/cm
Horz: 20 msec/cm

J31-20

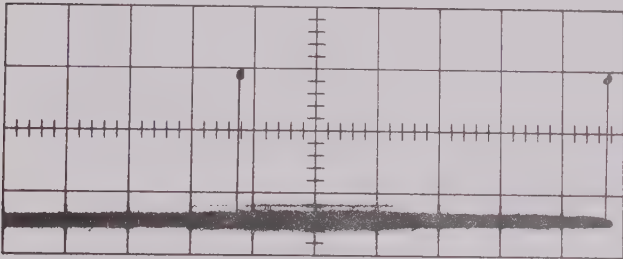


Figure h

Vert: 0.5V/cm
Horz: 20 msec/cm

J30-10

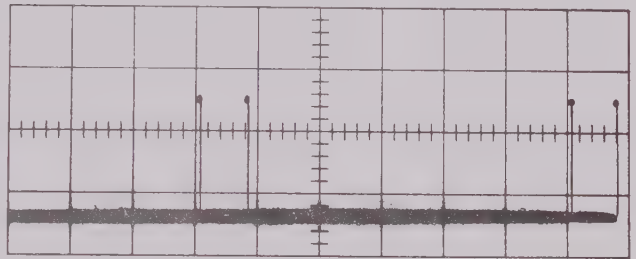


Figure i

Vert: 0.5V/cm
Horz: 20 msec/cm

J30-22

Figure 4-1. Counter Waveforms (Continued)

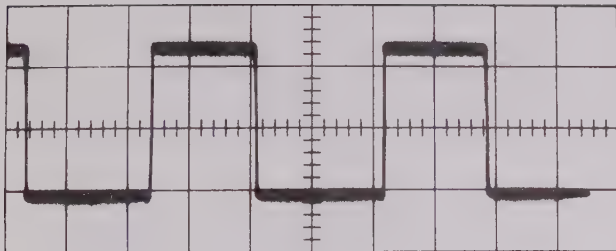


Figure j

Vert: 0.5V/cm
 Horiz: 1 μ sec/cm

J30-14
 J39-4

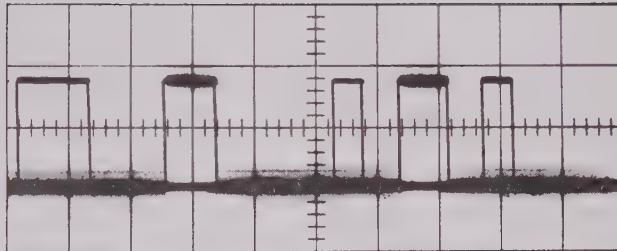


Figure k

Vert: 0.5V/cm
 Horiz: 1 msec/cm

J33-4
 J34-4

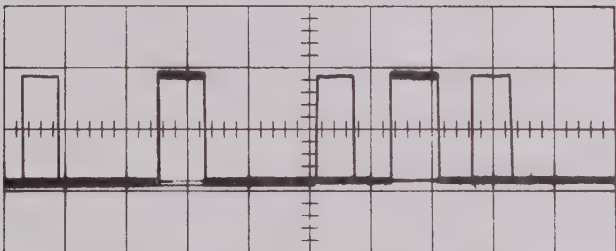


Figure l

Vert: 0.5V/cm
 Horiz: 100 μ sec/cm

J35-4
 J36-4

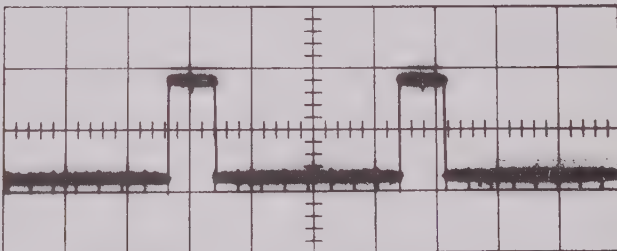


Figure m

Vert: 0.5V/cm
 Horiz: 10 μ sec/cm

J37-4
 J38-4

Figure 4-1. Counter Waveforms (Continued)

TABLE 4-2 LEVEL METER TROUBLESHOOTING CHART (Continued)

Symptom	Probable Cause	Immediate Action
SELECTIVITY Indicator Out DECIBELS Meter Lit	Lamp Burned Out	Press SELECTIVITY Switch. If indicator fails to light, check fuse.
INPUT LEVEL Indicator Lit	Fuse F2 Blown	Press SELECTIVITY Switch. If indicator fails to light, check fuse.
SELECTIVITY Indicator Lit DECIBELS Meter Out INPUT LEVEL Indicator Out	5V ac Power Supply Faulty	Check 5-volt Power Supply
SELECTIVITY Indicator Lit	SCALE Switch Expanded	Check Switch position.
DECIBELS Meter Out	Lamp Burned Out	Replace Lamp
INPUT LEVEL Indicator Lit		
SELECTIVITY Indicator Lit	SENSITIVITY Switch	Check Switch position.
DECIBELS Meter Lit	in CAL	
INPUT LEVEL Indicator Out	Display Malfunction	Check Display

TABLE 4-3 INDICATIONS THAT ADJUSTMENT OR DETAILED TROUBLESHOOTING IS NECESSARY

Immediate Action Table 4-2 does not repair trouble.
Unable to verify any parameter in 4.b.2.
Cannot zero meter with CAL control.
Reference Oscillator cannot zero meter with an external standard.
DECIBELS Meter indication differs when SCALE switch is in NORM and EXPAND position.
DECIBELS Meter indication differs when SELECTIVITY switch is in WB and NB condition.

TABLE 4-3 INDICATIONS THAT ADJUSTMENT OR DETAILED TROUBLESHOOTING IS NECESSARY (Continued)

DECIBELS Meter indication does not differ 20 dB when SENSITIVITY switch is in NORM and HIGH position (with input signal).

4. Tunable Signal Generator

The tuning unit controls the signal generator, so in the event of major malfunction the outputs of the tuning unit should be verified before starting a detailed troubleshooting procedure. Table 4-4 lists simple troubles that the operator can recognize and rectify. Table 4-5 lists troubles that require major troubleshooting effort.

TABLE 4-4 SIGNAL GENERATOR TROUBLESHOOTING CHART

Symptom	Probable Cause	Immediate Action
No lights on front panel	Fuse F1 Blown	Replace Fuse
	Unplugged from Tuning Unit	Replace Plug
Any one indicator lamp out	Burned-out lamp	Replace Lamp

TABLE 4-5 MAJOR GENERATOR TROUBLES

- a. Cannot complete paragraphs IV. B.3. or IV. B.4.
- b. Frequency will not stabilize.
- c. Cannot calibrate.
- d. No display on OUTPUT LEVEL indicator.

D. ALIGNMENT PROCEDURE

This subsection is divided into three major paragraphs. Each major paragraph specified the alignment procedure for one piece of equipment.

The factory has aligned and adjusted the equipment before delivery, so no initial adjustment should be required unless a component has been changed.

No change in adjustments should be attempted unless the required test equipment is on hand, and the complete alignment procedure may be carried out.

The required test equipment follows. Equivalent equipment may be used.

RF Signal Generator	Hewlett-Packard HP606A
Milliammeter	Hewlett-Packard HP428B
DC Vacuum Tube Voltmeter	Hewlett-Packard HP412A
AC Vacuum Tube Voltmeter	Hewlett-Packard HP400L
VHF Attenuator	Hewlett-Packard HP355B
Differential Voltmeter	Fluke 801
Frequency Counter	Hewlett-Packard HP524C
Frequency Converter	Hewlett-Packard HP525A
Oscilloscope	Tektronix 543
Frequency-Selective Level Meter	Sierra Model 305A-L
Coaxial Termination Load	Sierra Model 160-1
RF Microvoltmeter W/Hi Impedance Probe	Millivac MV28B
RF Oscilloscope	Tektronix 581
Attenuator Network	Daven VT795G
Audio Oscillator	Hewlett-Packard HP200CD

Many adjustment procedures interact, one on another, so the user should follow this procedure, step-by-step; however, any of the three equipments may be adjusted by itself.

1. Tuning Unit Model 305A-T

The tuning unit must be aligned before attempting alignment of the other two equipments.

Prior to aligning the tuning unit, remove all boards.

a. Power Supplies. To align the power supplies, proceed as follows.

- (1) Insert Power Supply Board A1 into Jack J25. Connect a multimeter between Test Points TP2 and TP3. Adjust potentiometer R8 for a 6.0-volt indication on the multimeter.
- (2) Insert Power Supply Board A2 into Jack J26. Connect a multimeter from Test Point TP2 to TP3. Adjust potentiometer for a +3.5 volt indication on the multimeter.

- (3) Insert Power Supply Board A3 into Jack J27. Connect a multimeter from Test Point TP2 to TP3. Adjust potentiometer R7 for a minus 16 volt meter indication.
 - (4) Connect a multimeter between Test Points TP2 and TP6. Adjust potentiometer R18 for a minus 6 volt meter indication.
- b. Frequency Synthesizer. To align the frequency synthesizer, proceed as follows:
- (1) Insert the following: 1 MHz, clock-J12, Board A4-J15, and Board A6 - J13. Wait 15 minutes for stabilization.
 - (2) At Board A6, set switch S1 to the TEST position and center potentiometers R8, R14 and R20.
 - (3) With an oscilloscope at Test Point TP8, adjust Inductor L4 for maximum sine wave amplitude.
 - (4) With a dc voltmeter at Test Point TP4, adjust potentiometer R14 for a minus 8.5-volt meter indication.
 - (5) With a dc voltmeter at Test Point TP9, adjust potentiometer R22 for a minus 9.0 volt indication on the meter.
 - (6) With an oscilloscope at Test Point TP4, adjust potentiometer for a 2.5-volt, peak-to-peak, sine wave.
 - (7) Set switch S1 to the OPERATE position.
 - (8) Adjust potentiometer R22 toward both extreme position. At some range a dc trace will be observed moving up and down on the oscilloscope. Mark the most positive and most negative position of this trace before it breaks into oscillations, and center the trace with R22 midway between those two extremes.
 - (9) Terminate Jack J6 on the back panel with 50 ohms, then, with a frequency counter, verify that the output is $19.0 \text{ MHz} \pm 10 \text{ Hz}$.

NOTE: The 1 MHz oscillator requires three hours for stabilization.

- (10) Insert Board A5 into Jack J14. Align this board exactly as Board A6. Terminate Test Point TP8 with 50 ohms. The output will be 19.1 MHz.

c. Coarse Tuning. To align the coarse tuning section, proceed as follows:

- (1) Insert Board A8 into Jack J19, and insert Plug P41 into Board A8.
- (2) Connect a dc power supply between Pin 2 P41 and ground. Adjust the power supply for minus 12 volts at pin 2.
- (3) At the back panel, terminate Jacks J7 and J9 with 50 ohms.
- (4) Connect a 100 ohm resistor between pins 2 and 6 on Jack J28.
- (5) Center potentiometer R9 and COARSE TUNING control.
- (6) With an oscilloscope, verify the waveform at P41-1 to be as indicated in Figure 4-2.a., and the waveform at P41-4 to be as indicated in Figure 4-2.b.
- (7) With an oscilloscope at Test Point TP2, adjust potentiometer R9 for a 1.2-volt, peak-to-peak, sine wave.
- (8) Adjust COARSE TUNING fully counterclockwise.
- (9) With a frequency counter at Jack J7 adjust Inductor L1 for a 39.8 MHz frequency indication.
- (10) Adjust COARSE TUNING control fully clockwise. Adjust capacitor C4 for a 73.8 MHz frequency indication.
- (11) Repeat steps (7) through (9), as necessary, until both frequency extremes are within 100 kHz of the required frequency.
- (12) Insert Board A9 into Jack J16. Center potentiometer R9, capacitor C11, and COARSE TUNING control.
- (13) With an oscilloscope at Test Point TP4, adjust capacitor C5 for the waveform illustrated in Figure 4-2.c.
- (14) With an oscilloscope at Test Point TP3, adjust capacitor C9 for the waveform illustrated in Figure 4-2.d.

NOTE: If no waveform appears at Test Point TP3, press LOCK-CONT switch.

- (15) Insert Board A10 into Jack J17.

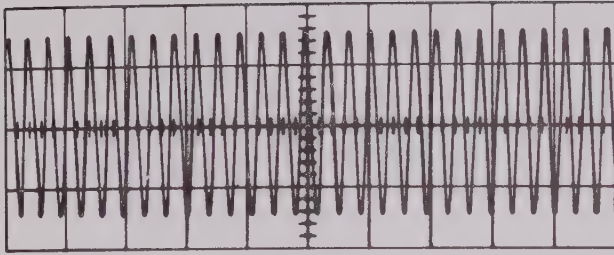


Figure a

Vert: 0.5V/cm
 Horz: 0.05 μ s/cm

P41-1

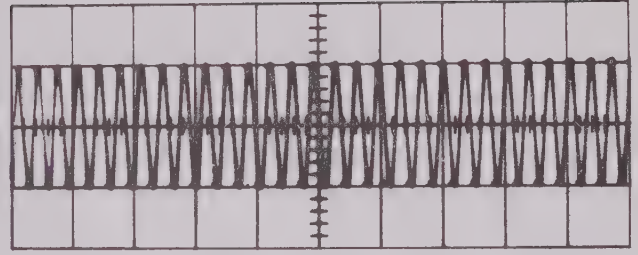


Figure b

Vert: 1V/cm
 Horz: 0.05 μ s/cm

P41-4

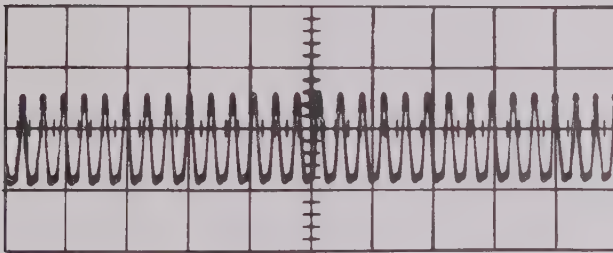


Figure c

Vert: 0.5V/cm
 Horz: 0.05 μ s/cm

A9-TP4

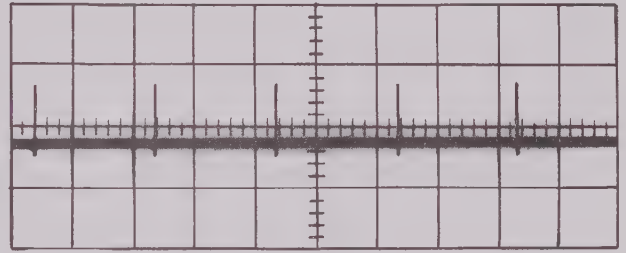


Figure d

Vert: 5V/cm
 Horz: 5 μ s/cm

A9-TP3

Figure 4-2. Tuning Unit Waveforms

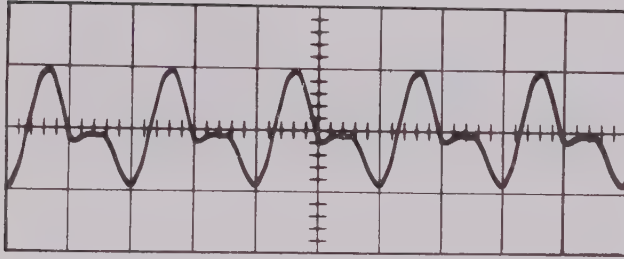


Figure e

Vert: 5V/cm
Horz: 5 μ s/cm

A10 TP3

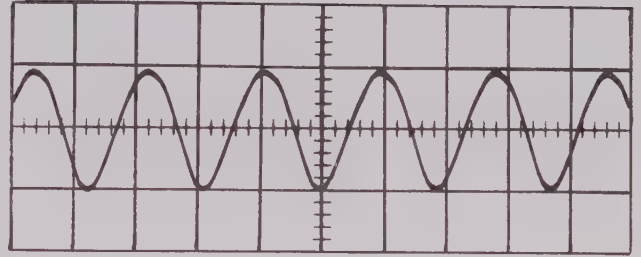


Figure f

Vert: 0.5V/cm
Horz: 2 μ s/cm

A13 TP3

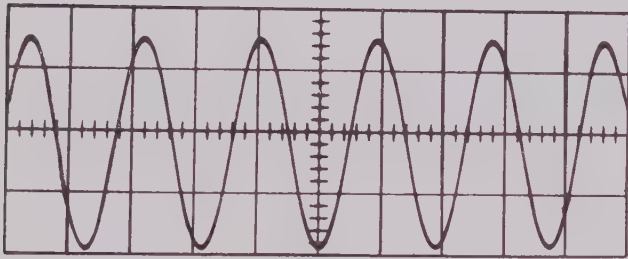


Figure g

Vert: 2V/cm
Horz: 2 μ s/cm

A13 TP6

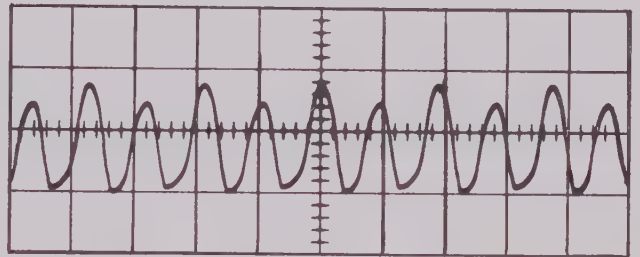


Figure h

Vert: 5V/cm
Horz: 2 μ s/cm

Figure 4-2. Tuning Unit Waveforms (Continued)

- (16) With an oscilloscope at Test Point TP3, adjust Potentiometer R7 for the waveform illustrated in Figure 4-2.e.
 - (17) Disconnect power supply, and short pin 2 of Plug P41 to ground.
 - (18) Insert Board A11 into Jack J18, and set potentiometer R13 fully counterclockwise.
 - (19) With an oscilloscope at Test Point TP2, adjust COARSE TUNING control slightly, until a 4 to 6 kHz waveform appears.
 - (20) In this order, alternately adjust the following controls for maximum waveform amplitude: Board A9, Potentiometer R9, Capacitors C11, C5 and C9.
 - (21) Repeat step (19) as required.
 - (22) At Board A10, adjust Potentiometer R7 for a 2-Volt peak-to-peak signal.
 - (23) Set the oscilloscope to dc input. Remove the jumper installed in step (17), and adjust COARSE TUNING control for the last dc indication before hitting the counterclockwise stop.
 - (24) Vary COARSE TUNING control and mark the positive-most and negative-most vertical excursion of the dc line. Adjust potentiometer R7 on Board A10 for a 4-volt total vertical excursion.
 - (25) Adjust COARSE TUNING Control for the last dc indication before hitting the clockwise stop. Vary the COARSE TUNING Control and mark the positive-most and negative-most excursion of the dc line. Adjust R7 on Board A10 for a 4-volt total excursion.
- d. Fine Tuning. To align the fine tuning section, proceed as follows:
- (1) Insert Board A12 into Jack J20, and set FINE TUNING control to mid-range.
 - (2) Connect a 1.0 millihenry choke between Test Points TP3 and TP5. Connect an oscilloscope across the choke.
 - (3) Adjust Potentiometer R6 for a 6-volt, peak-to-peak signal.
 - (4) Terminate J30 - 16 to 18 with a 1 K/150 ohm test connector.

- (5) Set FINE TUNING control fully counterclockwise. With a frequency counter at Test Point TP4, adjust Inductor L1 for a 206 kHz frequency indication.
- (6) Set FINE TUNING control fully clockwise. Adjust capacitor C8 for a frequency indication of 324 kHz.
- (7) Repeat steps (5) and (6) until both frequency extremes are within 1 kHz of the desired frequency.
- (8) Install Board A15 into Jack J24. Terminate Jacks J8, J10 and J11 on the back panel in 50 ohms.
- (9) With a dc voltmeter at Test Point TP6 of Board A15, adjust potentiometer R2 for a minus 13-volt meter indication.
- (10) With a frequency counter at J8, adjust Inductor L1 for a 18.99 to 19.01 MHz frequency indication.
- (11) Insert Board A16 into Jack J23. Center Potentiometer R1 and Capacitor C1.
- (12) With an oscilloscope at Test Point TP3, adjust inductor L1 for maximum signal amplitude.
- (13) Insert Board A13 into Jack J22. Set Potentiometer R11 fully counterclockwise. Disconnect the inductor that was installed in step (2).
- (14) With an oscilloscope at Test Point TP2, adjust Potentiometer R4 for the waveform illustrated in Figure 4-2.d.
- (15) Set FINE TUNING control fully clockwise. With an oscilloscope at Test Point TP6 on Board A13, adjust Potentiometer R6 on Board A12 for the waveform illustrated in Figure 4-2.g.
- (16) Short Test Point TP3 to ground. With a dc voltmeter at Test Point TP4, adjust Potentiometer R8 for a 8.0 volt meter indication. Remove short from Test Point TP3.
- (17) With an oscilloscope at Test Point TP4, adjust Potentiometer R11 for the waveform illustrated in Figure 4-2.h.
- (18) Insert Board A14 into Jack J21.

- (19) Set the input of an oscilloscope to dc, and set sensitivity to 1V/cm position, then connect to Test Point TP2.
- (20) Connect a frequency counter to Jack J8 on the rear panel and set FINE TUNING CONTROL fully counterclockwise.
- (21) Adjust Inductor L1 on Board A15 for a dc indication on the oscilloscope and an 18894 kHz indication on the counter.
- (22) Short Test Point TP1 and TP5 on A16. Mark the position of the dc trace.
- (23) Remove the short and adjust Inductor L1 on A16 for a dc trace coincident to the mark in step (22).
- (24) Tune FINE TUNING Control through its range. Verify that the dc trace does not break into ac. If it does, tune the control to the point just before the trace breaks up. Mark the trace position. Short Test Points listed in step (22), and adjust Potentiometer R8 on Board A13 to make the resulting dc trace coincide with the mark. Repeat steps (23) and (24).
- (25) Repeat steps (22) through (24) until the following conditions are met.
 - (a) FINE TUNING Control may be tuned over its entire range while the dc trace remains locked.
 - (b) The positions of the bias trace (step 22) and the dc trace (step 23) coincide exactly at the counterclockwise end of FINE TUNING Control.
 - (c) The positions of the bias trace and the dc trace coincide within $-0V$ dc to $+0.3V$ dc at the clockwise end of FINE TUNING Control.
 - (d) The frequency at Jack J8 is $18894 \text{ kHz} \pm 1 \text{ kHz}$ when FINE TUNING Control is fully counterclockwise.
- (26) Slowly tune FINE TUNING control counterclockwise observing dc trace. If an ac indication is observed, perform the following:
 - (a) Tune FINE TUNING control counterclockwise until the dc trace is again observed. Mark the vertical position.
 - (b) Short Test Point TP5 to TP1 on Board A16, and adjust

Potentiometer R8 on Board A13 so that the dc trace coincides with the mark produced in step (a) above. Repeat step (25).

- (27) Adjust FINE TUNING control counterclockwise, and repeat steps (23) through (26) until the following criteria are met:
- (a) FINE TUNING control may be rotated through its entire range while the dc trace remains locked.
 - (b) In the counterclockwise position of the FINE TUNING control, when Test Points TP5 and TP1 are shorted, the vertical position of the dc trace corresponds with the position when the short is removed.
 - (c) When tuning FINE TUNING control from the full counterclockwise position to the full clockwise position, the dc trace remains within the range of +0.0 to +0.3 volts of its level at the counterclockwise position.
 - (d) When the FINE TUNING control is fully counterclockwise, the frequency at Jack J8 on the back panel is 18893 to 18894 kHz.
 - (e) When the FINE TUNING control is fully clockwise, the frequency at Jack J8 on the back panel is 18775 to 18777 kHz.
 - (f) Relay K1 energizes when a finger is placed near Inductor L1 on Board A15. The relay deenergizes when the finger is removed.
 - (g) When TUNING MODE switch is in CONT condition, CONT light goes out when Relay K1 energizes (see step (f)).
- e. Final Alignment. After accomplishing steps a. through d., replace all remaining boards, and install the cover on the Tuning Unit.

2. Frequency-Selective Level Meter, Model 305A-L

This major paragraph makes use of another Model 305A-L Level meter as a piece of test equipment. That meter will be referred to as the test meter, as contrasted to the meter being aligned. The meter being aligned will be referred to as the level meter.

For the location of the circuit boards mentioned herein, see Figure 3-31. Unless otherwise specified, all boards should be first installed on a riser board, then, after adjustment installed in their regular socket.

This major paragraph is separated into Preliminary Adjustment and Final Adjustment paragraphs.

a. Preliminary Adjustment. This paragraph is separated into eight sub-sections.

- (1) Power Supply Adjustment. To adjust the power supply proceed as follows:
 - (a) Deenergize the equipment, and remove all circuit boards from their sockets.
 - (b) With a multimeter, verify that the dc resistance between each of the two current-carrying contacts on the power cord and ground exceeds 10K ohms.
 - (c) Install the power plug to a variable source of ac power, and set the source voltage for 115 volts.
 - (d) With the multimeter still installed, vary the source voltage between 105 and 125 volts. Verify that the multimeter indication does not change, and reinstall all circuit boards.
- (2) Sideband Oscillator Adjustment. To adjust the sideband oscillator, proceed as follows:
 - (a) Connect a frequency counter and Test Point TP3 to the oscilloscope vertical input. Test Point TP4 is ground.
 - (b) Set AUDIO MODE switch to LS position, and adjust Inductor L3 for maximum oscilloscope indication (approximately 2.0 volts, peak-to-peak). Verify that the counter indicates 2.2135 MHz $\pm$ 110 Hz.
 - (c) Set AUDIO MODE switch to US position. Adjust Inductor L1 for maximum oscilloscope indication (approximately 2.0 volts, peak-to-peak). Verify that the counter indicates 2.2165 MHz $\pm$ 110 Hz.
 - (d) Install Board A11, and connect an HP606 signal generator to Test Point TP1. Connect an ac voltmeter to either PHONE jack. Terminate signal generator output cable with 56 ohms.

- (e) Adjust the signal generator for a 2.215 MHz, 700 microvolt signal that is modulated 30 percent at 1 kHz.
 - (f) Set SENSITIVITY switch to HIGH position, and adjust AUDIO GAIN control for mid-point. Adjust Inductor L1 for maximum indication on voltmeter. Note indication.
 - (g) Set SENSITIVITY switch to NORM position, and increase the signal generator output by 20 dB. Adjust Resistor R4 or A11 for the indication noted in (f).
 - (h) Verify an approximate 3.0 volt indication with the AUDIO MODE switch in AM, LS, and US positions.
- (3) Meter Circuit Adjustment. To adjust the meter circuit, proceed as follows:
- (a) Verify mechanical zero on meter.
 - (b) Install Board A9, and connect a HP606 Signal Generator to Test Point TP1 (TP2 is ground). Set the signal generator frequency to 2.215 MHz.
 - (c) Set SCALE switch (S6) to EXPAND position, and adjust the input signal amplitude for an on-scale reading.
 - (d) Alternately adjust Resistor R14 and the input signal amplitude for a 0 dB panel meter reading at a ± 7.0 dBm input signal strength.
 - (e) Set SCALE switch to NORM position. Adjust R17 for a 0 dB indication on the panel meter.
 - (f) Install Board A8, and connect the HP606 Signal Generator to Test Point TP1 (TP2 is ground).
 - (g) Set SENSITIVITY switch to HIGH position and adjust CAL control to mid-range. Adjust the signal generator for 2.215 MHz at -57.5 dBm.
 - (h) Adjust Inductors L1, L2 and L4 for maximum panel meter indication. Adjust Potentiometer R24 for a 0 dB indication on panel meter.
 - (i) Set SENSITIVITY switch to NORM position, and increase the signal input to -37 dBm. Adjust Potentiometer R2 for a +20 dB indication on the panel meter.

- (j) Disconnect temporary power supply, and connect and energize a Model 305A-T Tuning Unit.
- (4) Third Modulator, Narrow Band and Wide Band Followers, and Third Mixer and IF. To align the third IF stage, proceed as follows:
- (a) Install Board A1, and with an oscilloscope at Test Point TP2, adjust Inductor L1 for maximum indication on oscilloscope. Remove oscilloscope.
 - (b) Install Board A5. With the test 305A-L level meter, monitor the signal at Test Point TP6 (TP7 is ground).
 - (c) Tune the newly-installed tuning unit to 1 MHz, 50 kHz. Alternately adjust Resistor R14 and capacitors C9 and C10 for a minimum 18.835 MHz signal at Test Point TP6.
 - (d) Remove the test level meter and replace with a HP606 Signal Generator. Set SENSITIVITY switch to NORM position. Set SELECTIVITY switch to WB.
 - (e) Tune the signal generator for maximum panel meter indication (approximately -60 dBm at 2.215 MHz). Adjust Inductors L2 and L4 for maximum panel meter indication.
 - (f) Tune the signal generator to approximately 21.05 MHz, then tune FINE TUNING control on the tuning unit for maximum indication on the panel meter.
 - (g) Adjust the attenuation on the signal generator for a 0 dB indication on the panel meter.
 - (h) Switch SELECTIVITY switch to NB (white) and tune FINE TUNING control for maximum indication on the panel meter. Adjust Potentiometer R24 on Board A6 for a 0 dB indication on the panel meter.
 - (i) Switch SELECTIVITY Switch to WB (green). Do not retune the tuning unit, but readjust the signal generator for a 0 dB indication.
 - (j) Repeat steps (h) and (i) as necessary.
 - (k) Reduce the tuning unit frequency by 1250 Hz. From that point slowly increase the tuning unit frequency by 2500 Hz.

Verify that the panel meter indication does not vary more than plus or minus 0.1 dB from the 0 dB indication.

- (5) Second IF Stage. To align the second IF stage, proceed as follows:
- (a) Install Boards A4 and A5.
 - (b) With an oscilloscope at Test Point TP3 on Board A3, adjust Inductor L2 for maximum oscilloscope indication.
 - (c) Install Board A2, and with a Model 305 test meter tuned to 19.0 MHz at Test Point TP4 of Board A4 (TP5 is ground), alternately adjust potentiometer R14 and capacitors C7 and C10 for maximum indication on the test meter.
 - (d) Replace the test meter with a Telonic Sweep Generator, and connect an oscilloscope through the sweep generator's detector to Test Point TP1 of Board A6 (TP2 is ground). Sync the oscilloscope to the sweep generator.
 - (e) Adjust the sweep generator to 40.04 MHz, then, alternately adjust Inductors L1, L2 and L3 on Board A5 for a flat-topped indication on the oscilloscope.
 - (f) Replace the sweep generator with a HP606 signal generator. Adjust the signal generator to 40.05 MHz, and tune the tuning unit for a maximum indication on the panel meter.
 - (g) Adjust the signal generator's output for a 0 dB indication on the panel meter. Verify that the signal generator output is approximately -69 dBm.
 - (h) With a MODEL 305 test meter at Jack J27 (back panel) tune the test meter for maximum indication. Verify that the frequency is between 21.0 and 21.1 MHz and that the signal is -32 dBm $\pm$ 3 dB. Note level.
 - (i) Set SENSITIVITY switch to HIGH position. Reduce the sweep generator by 20 dB, and adjust Potentiometer R24 on Board A4 for the level noted in step (h).

- (6) First IF Stage. To align the first IF stage, proceed as follows:
- (a) Install Boards A2 and A3.
 - (b) Set SENSITIVITY switch to NORM position, then connect a HP606 signal generator to Test Point TP1 on Board A2 (TP2 is ground). Adjust the signal generator for a -83 dBm, 40.05 MHz signal.
 - (c) With an RF millivoltmeter at Test Point TP4 of Board A3, adjust capacitor C11 for a 1.0-volt indication on millivolt meter.
- (7) Low-Pass Filter. To align the low-pass filter, proceed as follows:
- (a) Connect a HP606 Signal Generator to INPUT jack on the front panel.
 - (b) Set SENSITIVITY switch to HIGH position, and set SELECTIVITY to WB (green).
 - (c) Tune the signal generator for 40.04 MHz at a 0 dBm level, and adjust the level meter attenuators to obtain an on-scale indication.
 - (d) Adjust capacitor C9 on Board A14 for a minimum indication on the panel meter (less than -80 dB).
 - (e) Connect a HP608 Signal Generator to Jack J24 on the back panel. Tune the HP608 Signal Generator for 81.65 MHz at 0 dBm.
 - (f) Tune the HP606 Signal Generator for 41.7 MHz at 0 dBm. Carefully tune the HP608 Signal Generator for a peak indication on the panel meter.
 - (g) Adjust Capacitor C13 on Board A14 for a minimum panel meter indication (less than -80 dB).
 - (h) Tune the HP606 Signal Generator for 46.07 MHz at 0 dBm. Carefully tune the HP608 Signal Generator for a peak indication on the panel meter (approximately 86.1 MHz).
 - (i) Adjust Capacitor C6 for a minimum panel meter indication (less than -80 dB).

- (j) Tune the HP616 Signal Generator to 58.33 MHz at 0 dBm. Carefully tune the HP608 Signal Generator for a peak indication on the panel meter (approximately 98.27 MHz).
 - (k) Interchange the two signal generators.
 - (l) Tune the HP608 signal for 102.5 MHz at 0 dBm. Carefully tune the HP606 Signal Generator for a peak indication on the panel meter (approximately 62.5 MHz).
 - (m) Adjust Capacitor C2 for a minimum indication on the panel meter (less than -80 dB).
 - (n) Repeat steps (a) through (m).
- b. Final Alignment. After the rough alignment performed in the preceding paragraph, perform the alignment specified herein.
- (1) Meter Circuit. Perform the final meter circuit alignment as follows:
 - (a) Set the meter switches as follows:

SENSITIVITY	NORM
INPUT LEVEL	-2 dBm
SCALE	NORM
SELECTIVITY	W.B. (green)
AUDIO MODE	AM
 - (b) At the tuning unit, set POWER switch to ON, TUNING MODE switch to LOCK, and tune COARSE TUNING control to 1.00 MHz.
 - (c) Connect a HP606 Signal Generator to INPUT Jack on the front panel. Tune Signal Generator to 1 MHz and adjust output level for a 0 dB indication on the panel meter.
 - (d) Set SCALE switch to EXPAND position. Set INPUT LEVEL Display to -4 dBm. Adjust CAL control for a +2 dB indication on the panel meter.
 - (e) Set INPUT LEVEL Display to 0 dBm and adjust potentiometer R14 on Board A9 for a -2 dB indication on the panel meter.
 - (f) Repeat steps (d) and (e) until the two indications balance. This process can be hastened by initial overcorrection.

- (g) Adjust CAL control for a 0 dB indication on the panel meter.
 - (h) Set SCALE switch to NORM and adjust potentiometer R16 on Board A9 for a 0 dB indication on the panel meter.
 - (i) Operate SELECTIVITY Switch to NB (white). Operate the tuning unit TUNING MODE Switch to LOCK (green), and peak the indication on the panel meter by adjusting FINE TUNING Control.
 - (j) Adjust Inductors L1, L2 and L4 on Board A8, for maximum indication on panel meter.
 - (k) Set SENSITIVITY Switch to HIGH Position. Adjust the 10 dB step attenuator for a 0 dBm indication on INPUT LEVEL Display. Adjust CAL Control for a 0 dB indication on the panel meter.
- (2) Set SENSITIVITY Switch to NORM Position. Adjust the 10 dB step attenuator for a 0 dBm indication on INPUT LEVEL Display. Adjust Potentiometer R2 on Board A8 for a 0 dB indication on the panel meter.
- (3) Third IF Stage. To finally align the third IF stage, proceed as follows:
- (a) Set SCALE Switch to EXPAND Position. Operate SENSITIVITY switch to WB state (green) and adjust CAL control as necessary for a 0 dB panel meter indication.
 - (b) Operate SELECTIVITY Switch to NB (white) state, and adjust Potentiometer R24 on Board A6 for a 0 dB indication on the panel meter. Recheck for 0 dB in the WB state.
 - (c) Set SCALE switch to NORM Position, and operate SENSITIVITY Switch to the NB state. Adjust Inductors L2 and L4 for maximum panel meter indication.
- (4) First IF Stage. To align the first IF stage, proceed as follows:
- (a) At the tuning unit, operate TUNING MODE Switch to the LOCK condition.
 - (b) Adjust the signal generator for 1050 kHz, and tune the tuner for maximum indication on the panel meter.

- (c) Adjust Inductors L1, L5 and L7 on Board A2 for maximum indication on the panel meter.
- (5) Fine Tuning Frequency Response. To align the fine tuning response, proceed as follows:
- (a) Set Tuning Unit to 1050 kHz. Operate TUNING MODE Switch to the LOCK Condition, and adjust CAL Control for a 0 dB indication on the panel meter.
 - (b) With the FINE TUNING Control, tune to 990 kHz. If the panel meter indicates more than plus or minus 0.2 dB, adjust Inductor L3 on Board A5 to compensate for one-half of the meter deviation.
 - (c) While observing the panel meter, with the FINE TUNING Control, increase the frequency to 1110 kHz, compensate one-half of any deviation over 0.2 dB with Inductor L3 on Board A5, then repeat steps (a), (b), and (c).
- (6) Coarse Tuning Frequency Response. To align the coarse tuning frequency response, proceed as follows:
- (a) Adjust the tuning unit to 1010 kHz, and operate TUNING MODE Switch to the LOCK condition. Adjust CAL control for a 0 dB indication on the panel meter.
 - (b) Adjust the tuning unit to 10 kHz and operate TUNING MODE Switch to the LOCK condition. The panel meter should indicate between -0.2 and -0.4 dB. If the panel meter indicates more negative than -0.4 dB, adjust capacitor C11 on board A3 counterclockwise one-half turn and repeat steps (a) and (b). If the panel meter indicates more positive than -0.2 dB, adjust capacitor C11 one turn clockwise and repeat steps (a) and (b).
- (7) Gain Reference Oscillator. To finally align the gain reference oscillator, proceed as follows:
- (a) Set-up a Model 305A-G Signal Generator with a separate tuning unit. Connect the output of the signal generator to the input of the level meter. Set the signal generator output to 0 dB, and lock the separate tuning unit at 1000 kHz.

- (b) Operate the 115V-230V switch on both the tuning unit and the signal generator into the proper positions. Assemble the signal generator to the tuning unit. Plug-in and turn-on the tuning unit, then operate POWER switch on the signal generator to the ON condition.
- (c) Operate the signal generator OUTPUT switch to the OFF condition.
- (d) Set the SENSITIVITY switch to the CAL condition, and adjust tuning unit frequency for maximum indication on the panel meter.
- (e) With a screwdriver, adjust REF OSC potentiometer on the front panel to mid-range, then adjust potentiometer R13 on Board A1 for a 0 dB indication on the panel meter.
- (f) Repeat steps (a) through (e).
- (g) Set CAL control to midrange. Adjust Potentiometer R24 on Board A8 for a 0 dB indication on the panel meter.

3. Tracking Signal Generator

To align and adjust the tracking signal generator, proceed as follows:

- a. Remove all circuit cards from the signal generator.
- b. Operate the 115V-230V switch on both the tuning unit and the signal generator into the proper positions. Assemble the signal generator to the tuning unit. Plug-in and turn-on the tuning unit, then operate POWER switch on the signal generator to the ON condition.
- c. Install Board A8 into its jack and Board A7 through a riser card to its jack. With a dc multimeter between Test Points TP1 and TP2 on Board A7 (TP2 is ground), adjust Potentiometer R5 for a plus 22-volt indication on the meter.
- d. With a dc voltmeter between Test Points TP3 and TP2 on Board A7 (TP2 is ground), adjust potentiometer R15 for a minus 15-volt indication on the meter.
- e. Remove the card riser and install Board A7 in its connector.

- f. Install Board A9 through a riser card to its connector. With a digital voltmeter between Test Points TP5 and TP3 on Board A9 (TP5 is ground), adjust Potentiometer R6 for a 1.0192-volt indication on the meter. Install Board A9 into its connector.
- g. Install Board A5 and oven assemblies A1 and A5-1. Wait thirty minutes.
- h. Operate two CAL STAND switches to ON and 0 conditions.
- i. With a differential voltmeter between Test Points TP2 and TP3 of Board A5, set R5 on the front panel to midrange, then adjust Potentiometer R4 on Board A9 for a 0-volt indication on the meter.
- j. Install Board A6, through a riser card, into its connector. Adjust Potentiometer R13 for a zero indication on the panel meter.
- k. Operate CAL STAND switch to the +1 state. After 60 seconds, adjust Potentiometer R4 on the front panel (screwdriver adjustment next to CAL STAND +1 dB switch) for a +1 dB indication on the panel meter.
- l. Install Board A4. Adjust Capacitors C2, C6, C9, C13 and C16 twelve turns back from fully clockwise.
- m. Connect a signal generator to the input of Board A4. Adjust the signal generator for a 10-volt, 40 MHz signal.
- n. With an rf millivoltmeter at the Test Point TP8 of Board A5 (TP9 is ground), adjust Capacitor C9 for a minimum indication.
- o. Install Boards A3 and A12. With a signal generator, apply a 230 millivolt rms, 42 MHz signal to Jack J2 on the rear panel.
- p. With a dc voltmeter at Test Point TP3 of Board A3 (TP1 is ground), adjust Potentiometer R20 for a $1.5 \pm 0.1V$ indication on the voltmeter.
- q. With a signal generator, apply a 25 millivolt rms, 40.15 kHz signal to Test Points TP8 and TP7 of Board A3 (TP9 is ground).
- r. With an rf millivoltmeter at Test Point TP9 of Board A3 (TP10 is ground), adjust Inductor L5 for maximum indication, then adjust Potentiometer R27 for a 150 millivolt indication.
- s. With a frequency counter at pin 7 of socket A1 (pin 6 is ground), adjust A1 adjustment for a 21.215000 MHz indication.

- t. Install Board A2, using a card riser.
- u. With a signal generator, apply a 205-millivolt rms, 18.835 MHz signal to Jack J1 on the back panel.
- v. With an rf voltmeter at Test Point TP3 of Board A2 (TP4 is ground), adjust Inductors L1, L2 and L3 for a maximum indication on the meter. Adjust Potentiometer R4 for a 1-volt rms indication.
- w. With the rf millivoltmeter at Test Point TP5 of Board A2, adjust Potentiometer R11 and Transformer T1 for maximum meter indication. Then readjust R11 for a 50 millivolt rms indication.
- x. With the rf millivoltmeter at Pin 2 of Jack J2 (Pin 3 is ground), adjust inductors L6 and L7 for maximum meter indication.
- y. Remove the riser card, install Board A2 in its connector, then readjust R11 for a 50 millivolt rms meter indication.
- z. With another signal generator, apply a 250 millivolt rms, 18.835 MHz signal to Jack J2 on the rear panel.
- (aa) With an rf millivoltmeter at Test Point TP8 of Board A5 (TP9 is ground), adjust Potentiometer R27 on Board A3 and R11 on Board A2 for a 28 millivolt rms indication on the meter.

SECTION V

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC OPERATION

Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
A0	<u>ELECTRICAL PARTS LIST CHASSIS</u>				
AT1	TERMINATION, Resistor, 51 Ω with Chain	914600123	Amphenol	35650-51	3
AT2	Same as AT1				
AT3	Same as AT1				
C1	CAPACITOR, Variable Air, 8.3-73 pF	902800730	Hammerlund	A02385400	1
C2	CAPACITOR, Variable Air, 50-450 pF	902810451	Radio Condenser	A02008100	1
C3	CAPACITOR, Fixed, .9 to .9 μ Fd, 220V ac	902100804	Aerovox	P138F44	1
C4	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	1
C5	CAPACITOR, Tantalum, 10 μ F, 150VDCW 20% w/Sleeving	902740106	Texas Instrument	SCM106BP015D4	1
CR1	RECTIFIER, 12A, 100V, PRV	910800022	Motorola	MR1121	8
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
CR5	Same as CR1				
CR6	Same as CR1				
CR7	Same as CR1				
CR8	Same as CR1				
F1	FUSE, 2.0A SLO-BLO	913200040	Bussman	MDL-2	1
F2	FUSE, 1.0A SLO-BLO	913200007	Bussman	MDL-1	1
J1	CONNECTOR, Receptacle, 3 Conductor	914800077	Switchcraft	AC39	1
J2	CONNECTOR, Receptacle, 115/230V ac, Mini-	914800086	Alden	402ACEHG	2
J3	CONNECTOR, Receptacle Space	914800087	Elco	01-3106-106	1
J4	Same as J2				
J5	CONNECTOR, BNC Panel UG-1094/U	914600035	Amphenol	74868	1
J6	CONNECTOR, BNC Jack, Bulkhead	914600112	King	KC-19-68	6
J7	Same as J6				
J8	Same as J6				
J9	Same as J6				
J10	Same as J6				
J11	Same as J6				
J12	Not Used				
J13	CONNECTOR, Printed Ckt. 15 Pin	914800074	Viking Ind. Inc.	A02360001	15
J14	Same as J13				
J15	Same as J13				
J16	Same as J13				
J17	Same as J13				
J18	Same as J13				
J19	Same as J13				
J20	Same as J13				
J21	Same as J13				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ELECTRICAL PARTS LIST CHASSIS (Continued)</u>				
J22	Same as J13				
J23	Same as J13				
J24	Same as J13				
J25	Same as J13				
J26	Same as J13				
J27	Same as J13				
J28	CONNECTOR, Printed Ckt., 22 Pin	914800075	Viking Ind.	A02360002	11
J29	Not Used				
J30	Same as J28				
J31	Same as J28				
J32	Same as J28				
J33	Same as J28				
J34	Same as J28				
J35	Same as J28				
J36	Same as J28				
J37	Same as J28				
J38	Same as J28				
J39	Same as J28				
K1	RELAY, 200 Ω , 32 mA max., DPDT	912600055	G.E.		2
K2	RELAY, 1500 Ω , 5.8 mA, P.C. Mtg., SPDT, 12 Contact	912600026	Sigma	11FP-1500G-SIL	1
K3	Same as K1				
L1	INDUCTOR, Fixed Molded, 0.47 μ H $\pm$ 20%, 1/4W	909000126	Delevan	1537-06	4
L2	INDUCTOR, Fixed Molded, 4.7 μ H $\pm$ 10%	909000123	Delevan	1537-716	2
L3	Same as L1				
L4	Same as L2				
L5	Same as L1				
L6	Same as L1				
Q1	TRANSISTOR, NPN, Power, 40251	910300058	RCA	40251	6
Q2	Same as Q1				
Q3	Same as Q1				
Q4	Same as Q1				
Q5	Same as Q1				
Q6	Same as Q1				
R1	RESISTOR, Fixed Composition, 390 Ω $\pm$ 5%, 1/4W	906900391	Speer		1
R2	RESISTOR, Fixed, 1 Ω $\pm$ 5%, 5W, Series 99	906200010	Ohmite	#4530	4
R3	Same as R2				
R4	Same as R2				
R5	Same as R2				
S1	SWITCH, DPDT, Push-On-Push-Off	911300014	Micro Switch Honeywell	302PB5-T-G	1
	LAMP For Above		Micro Switch Honeywell	T1	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ELECTRICAL PARTS LIST CHASSIS (Continued)</u>				
S2	SWITCH, DPDT, Push-On-Push-Off	911300018	Micro Switch Honeywell	302PB6-T-WB	1
	LAMP For Above		Micro Switch Honeywell	T-1	1
S3	SWITCH, Rotary, 4 PDT, 1" Dia.	911200108	Centralab	A02058600	1
S4	SWITCH, Slide, 115-230V ac, DPDT	911000040	Switchcraft	40256LF	1
T1	TRANSFORMER, Power, 115/230V ac Pri., Sec. 11.5V-12V, 15V-22V	910000097	Quality Trans.	A02447200	1
T2	TRANSFORMER, Pri. 115V ac, Sec. 115V ac	910000101	Quality Trans.	A02395800	1
XC01	OSCILLATOR, Crystal Controlled, 1.0 MHz, 115VAC Proportional Oven Control 16VDC Osc. Voltage, 4.0V P-P Output	912400002	Ovenaire	A02460300	1
XF1	FUSE HOLDER	913400014	Littelfuse	34004	2
XF2	Same as XF1				
XQ1	SOCKET, Transistor, Power	914200049	Augat	8080-1G2	6
XQ2	Same as XQ1				
XQ3	Same as XQ1				
XQ4	Same as XQ1				
XQ5	Same as XQ1				
XQ6	Same as XQ1				
XXC01	SOCKET, Octal, Ceramic	914000022	Amphenol	148-111	1
	CABLE ASSEMBLY, Fine Tuning Varicap		Sierra	B02471802	1
	CABLE ASSEMBLY, 1 MHz Clock		Sierra	B02469300	1
	CABLE ASSEMBLY, 19.0 MHz Output (J6)		Sierra	B02469200	1
	CABLE HARNESS (J7-11) (Main)		Sierra	D02448600	1
	CABLE HARNESS (Power Supply)		Sierra	C02448400	1
	CABLE HARNESS (Counter)		Sierra	D02463500	1
	DIGITAL DISPLAY Readout Display's, 7 Digital, 1 Mode - Model 355-3901-A-C1	919900030	Industrial Elec. Eng.	A02469004	1
	LAMP For Above		Industrial Elec. Eng.	C1	1
	GROMMET	915400024			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ELECTRICAL PARTS LIST CHASSIS (Continued)</u>				
	KEY, Polarizing For P.C. Board Connectors	914800076	Viking Ind.		40
	LUG SOLDER #4, Locking Type, 2 Wire Holes	918400013			16
	LUG SOLDER, 3/8", Locking	918400017			1
	TERMINAL, Strip, 6 Terminals	919100036			2
	TERMINAL, Standoff, 6-32 Stud	915100001			1
	WIRE #22 Teflon, Violet				
	WIRE #22 Teflon, Green				
	WIRE #22 Teflon, Black				
	POWER CORD, 3 Conductor, 8 Ft. Long	916400019	Belden	17258	1
A1	<u>+6V DC @ 1.8A POWER SUPPLY</u>		Sierra	C02463400	
C1	CAPACITOR, 1000 μ F, 35V, Plastic Sleeve	902250108	Syncro	EMW01946A	2
C2	Same as C1				
C3	CAPACITOR, .01 μ F, 150V	901440103	Centralab	DDM103	1
C4	CAPACITOR, 100 μ F, 30V	902260107	Syncro	EMMW21	1
CR1	DIODE, Silicon, 1N456	910500031			2
CR2	Same as CR1				
CR3	Same as CR1				
CR4	DIODE, Zener, 2V, 150 mW	910500071	Hoffman	Z3433	1
Q1	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild		1
Q2	TRANSISTOR, NPN, Silicon, 2N3641	910300044	Fairchild		1
Q3	TRANSISTOR, NPN, Silicon, Power	910300057	RCA	40250	1
Q4	TRANSISTOR, NPN, Silicon, 2N3565	910300046	Fairchild		2
Q5	Same as Q4				
R1	RESISTOR, 2.2K $\pm$ 5%, 1/2W	905000222	AB	EB	1
R2	RESISTOR, 3.3K $\pm$ 5%, 1/4W	906900332	Speer		2
R3	RESISTOR, 2.2K $\pm$ 5%, 1/4W	906900222	Speer		3
R4	RESISTOR, 1 Ω $\pm$ 5%, 3-1/4W, Series 99	906210010	Ohmite	4330	2
R5	Same as R4				
R6	Same as R3				
R7	Same as R2				
R8	POTENTIOMETER, 2K, Helitrim 62PA	907900228	Beckman Inst.		1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>+6V DC @ 1.8A POWER SUPPLY</u> (Continued)		Sierra	C02463400	
R9	RESISTOR, 5.6K $\pm 5\%$, 1/4W	906900562	Speer		1
R10	RESISTOR, 2.7K $\pm 5\%$, 1/4W	906900272	Speer		1
R11	Same as R3				
R12	RESISTOR, 270 $\pm 5\%$, 1/4W	906900271	Speer		1
	P.C. BOARD	904500237		C02463300	1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	4
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	CABLE Clamp	915300006	Holub	12	1
A2	<u>+3.5V DC @ 2.5A POWER SUPPLY</u>		Sierra	C02463000	
C1	CAPACITOR, 1000 μ F, 35V, Plastic Sleeve	902250108	Syncro	EMW01946A	2
C2	Same as C1				
C3	CAPACITOR, .01 μ F, 150V	901440103	Centralab	DDM-103	1
C4	CAPACITOR, 100 μ F, 30V	902260107	Syncro	EMMW21	1
CR1	DIODE, Silicon, 1N456	910500031	RCA		3
CR2	Same as CR1				
CR3	Same as CR1				
CR4	DIODE, Zener, 2V @ 150 mW	910500071	Hoffman	Z3433	1
Q1	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild		1
Q2	TRANSISTOR, NPN, Silicon, 2N3641	910300044	Fairchild		1
Q3	TRANSISTOR, NPN, Silicon, Power	910300057	RCA	40250	1
Q4	TRANSISTOR, NPN, Silicon, 2N3565	910300046	Fairchild		2
Q5	Same as Q4				
R1	RESISTOR, 2.2K $\pm 5\%$, 1/2W	905000222	AB	EB	1
R2	RESISTOR, 3.3K $\pm 5\%$, 1/4W	906900332	Speer		4
R3	Same as R2				
R4	RESISTOR, 1 ohm $\pm 5\%$, 3-1/4W, Series 99	906210010	Ohmite	4330	3
R5	Same as R4				
R6	Same as R4				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>+3.5V DC @ 2.5A POWER SUPPLY (Continued)</u>		Sierra	C02463000	
R7	RESISTOR, 2.2K $\pm 5\%$, 1/4W	906900222	Speer		2
R8	Same as R2				
R9	POTENTIOMETER, 2K, Helitrim, 62PA	906900228	Beckman Instr.		1
R10	Same as R2				
R11	RESISTOR, 2.7K $\pm 5\%$, 1/4W	906900272	Speer		1
R12	Same as R7				
R13	RESISTOR, Fixed Composition, 150 Ω $\pm 5\%$, 1/4W	906900151	Speer		1
	P.C. BOARD	904500235		C02462900	1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	4
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	CABLE CLAMP, 3/4 In. Dia.	915300006	Holub	12	1
A3	<u>-16V DC @ 0.3A -6.0V DC @ 0.5A POWER SUPPLY</u>		Sierra	C02463200	
C1	CAPACITOR, 1000 μ F, 35V, Plastic Sleeve	902250108	Syncro	EMW01946A	2
C2	CAPACITOR, 0.1 μ F, 50V, Disc Ceramic	901410104	Sprague	33C41	1
C3	CAPACITOR, 100 μ F, 30V, Plastic Sleeve	902260107	Syncro	EMMW21	2
C4	Same as C1				
C5	CAPACITOR, .01 μ F, 150V, Disc Ceramic	901440103	Centralab	DDM103	1
C6	Same as C3				
CR1	RECTIFIER, 3A @ 100V PRV	910800021	Motorola	MR1031	8
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
CR5	DIODE, Silicon, 1N456	910500031			7
CR6	Same as CR5				
CR7	Same as CR5				
CR8	DIODE, Zener, 6.2V 400 mV, 1N753A	910500001	Texas Instrument	1N753A	1
CR9	Same as CR5				
CR10	Same as CR1				
CR11	Same as CR1				
CR12	Same as CR1				
CR13	Same as CR1				
CR14	Same as CR5				
CR15	Same as CR5				
CR16	Same as CR5				
CR17	DIODE, Zener, 2V μ 150 mV	910500071	Hoffman	Z3433	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>-16V DC @ 0.3A -6.0V DC @ 0.5A POWER SUPPLY (Continued)</u>		Sierra	C02463200	
Q1	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild		2
Q2	TRANSISTOR, NPN, Silicon, 2N3641	910300044	Fairchild		2
Q3	TRANSISTOR, NPN, Silicon, Power	910300057	RCA	40250	2
Q4	TRANSISTOR, NPN, Silicon, 2N3565	910300046	Fairchild		4
Q5	Same as Q4				
Q6	Same as Q1				
Q7	Same as Q2				
Q8	Same as Q3				
Q9	Same as Q4				
Q10	Same as Q4				
R1	RESISTOR, 3900 Ω $\pm$ 5%, 1/2W	905000392	AB	EB	1
R2	RESISTOR, 3300 Ω $\pm$ 5%, 1/4W	906900332	Speer		4
R3	RESISTOR, Fixed Composition, 1200 Ω $\pm$ 5%, 1/4W	906900122	Speer		1
R4	RESISTOR, 2 Ω $\pm$ 5%, 3-1/4W, Series 99	906200020	Ohmite	4337	2
R5	RESISTOR, 2200 Ω $\pm$ 5%, 1/4W	906900222	Speer		5
R6	RESISTOR, 2700 μ $\pm$ 5%, 1/4W	906900272	Speer		3
R7	POTENTIOMETER, 2K, Melitrim, 62PA	907900228	Beckman Inst.		2
R8	RESISTOR, Fixed Composition, 3900 Ω $\pm$ 5%, 1/4W	906900392	Speer		1
R9	Same as R6				
R10	Same as R5				
R11	Same as R2				
R12	RESISTOR, 2200 Ω $\pm$ 5%, 1/2W	905000222	AB	EB	1
R13	Same as R2				
R14	Same as R5				
R15	Same as R4				
R16	Same as R5				
R17	Same as R2				
R18	Same as R7				
R19	RESISTOR, 4700 Ω $\pm$ 5%, 1/4W	906900472	Speer		1
R20	Same as R6				
R21	Same as R5				
R22	RESISTOR, 270 Ω $\pm$ 5%, 1/4W	906900271	Speer		1
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500236		C02463100	1
	CABLE CLAMP, 3.4 In.	915300006	Holub	12	2
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	8

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
A4	<u>DECADE DIVIDER & SPECTRUM GENERATOR</u>		Sierra	C02462800	
C1	CAPACITOR, Disc Ceramic, .01 μ F 150V	901440103	Centralab	DDM-103	14
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	Same as C1				
C6	CAPACITOR, Dura Mica, 47 pF $\pm 5\%$, 500V	901900470	El Menco	DM15-470J	3
C7	Same as C6				
C8	Same as C6				
C9	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	4
C10	Same as C1				
C11	Same as C1				
C12	Same as C1				
C13	Same as C1				
C14	Same as C9				
C15	Same as C1				
C16	Same as C1				
C17	Same as C1				
C18	Same as C1				
C19	Same as C1				
C20	Same as C9				
C21	CAPACITOR, Dura Mica, 100 pF $\pm 5\%$, 500V	901900101	El Menco	DM15-101J	2
C22	CAPACITOR, Dura Mica, 15 pF $\pm 5\%$, 500V	901900150	El Menco	DM15-150J	1
C23	CAPACITOR, Vert. Mtg. Plastic Encased NonPolarized 1.0 μ F, 25V	903300105	Nashville Elec.	8-250BP1- 25585NP	1
C24	Same as C9				
C25	Same as C21				
C26	CAPACITOR, Tantalytic, 1.0 μ F, 35V dc	902700105	Texas Instru.	SCM-105FP035D2	2
C27	Same as C26				
CR1	DIODE, 1N995	910500003	Transitron	1N995	1
L1	INDUCTOR, Fixed, 3.3 mW	909000116	J.W. Miller	70F333A1	5
L2	Same as L1				
L3	Same as L1				
L4	Same as L1				
L5	INDUCTOR, Fixed Molded 0.47 mH $\pm 20\%$, 1/4W	909000126	Delevan	1537-06	1
L6	Same as L1				
Q1	TRANSISTOR, NPN, Silicon, 2N3565	910300046	Fairchild	2N3565	1
Q2	TRANSISTOR, NPN, Silicon, 2N3641	910300044	Fairchild	2N3641	3
Q3	Same as Q2				
Q4	Same as Q2				
Q5	TRANSISTOR, PNP, Silicon, 2N3640	910300047	Fairchild	2N3640	1
Q6	TRANSISTOR, NPN, Silicon, 2N3563	910300042	Fairchild	2N3563	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>DECADE DIVIDER & SPECTRUM GENERATOR</u> (Continued)		Sierra	C02462800	
R1	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	Speer		4
R2	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		4
R3	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		5
R4	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		4
R5	Same as R3				
R6	RESISTOR, Fixed Composition, 56K $\pm 5\%$, 1/4W	906900563	Speer		1
R7	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222	Speer		3
R8	Same as R7				
R9	Same as R7				
R10	Same as R3				
R11	Same as R1				
R12	Same as R2				
R13	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/2W	905000391	AB	EB	1
R14	Same as R4				
R15	Same as R1				
R16	Same as R2				
R17	Same as R4				
R18	Same as R3				
R19	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		1
R20	RESISTOR, Fixed Composition, 15K $\pm 5\%$, 1/4W	906900153	Speer		1
R21	RESISTOR, Fixed Composition, 1K $\pm 5\%$, 1/4W	906900102	Speer		1
R22	Same as R3				
R23	RESISTOR, Fixed Composition, 4700 Ω $\pm 5\%$, 1/4W	906900472	Speer		2
R24	Same as R23				
R25	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123	Speer		1
R26	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		1
R27	RESISTOR, Fixed Composition, 1800 Ω $\pm 5\%$, 1/4W	906900182	Speer		1
XIC1	SOCKET, Integrated Ckt. 8 pin	914200050	Augat		1
IC1	DECADE DIVIDER	920300003	Fairchild	U5B995859X	1
	P.C. BOARD	904500234		C02462700	1
	INSULATED STANDOFF, Transistor	915100049	Regan	1932XM	6
	HANDLE, P.C. BOARD	920400021	Stoesser	C52528	1
A5	<u>19.1 MHz OSCILLATOR (C02461501)</u>				
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	2
C2	CAPACITOR, Disc Mica, 100 pF $\pm 5\%$, 500V	901900101	El Menco	DM15-101J	1
C3	CAPACITOR, Vert. Mtg. Plastic Encased Non-Polarized 10 μ F, 25V	903300106	Nashville Elec.	12-375BP 10-25S85NP	3
C4	Same as C1				
C5	CAPACITOR, Dura Mica, 15 pF $\pm 5\%$, 500V	901900150	El Menco	DM15-150J	3

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>19.1 MHz OSCILLATOR (Continued)</u>		Sierra	C02461501	
C6	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z500-102P	9
C7	CAPACITOR, Dura Mica, 330 pF $\pm$ 5%, 500V	901900331	El Menco	DM15-331J	2
C8	Same as C5				
C9	CAPACITOR, Dura Mica, 33 pF $\pm$ 2%, 500V	901900330	El Menco	DM15-330G	1
C10	Same as C5				
C11	Same as C3				
C12	CAPACITOR, Dura Mica, 4700 pF $\pm$ 5%, 500V	901900472	El Menco	DM19-472J	1
C13	CAPACITOR, Dura Mica, 220 pF $\pm$ 5%, 500V	901900221	El Menco	DM15-221J	1
C14	Same as C6				
C15	Same as C3				
C16	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	2
C17	CAPACITOR, Dura Mica, 470 pF $\pm$ 5%, 500V	901900471	El Menco	DM15-471J	1
C18	Same as C7				
C19	Same as C6				
C20	Same as C6				
C21	Same as C6				
C22	Same as C6				
C23	CAPACITOR, Dura Mica, 180 pF $\pm$ 5%, 500V	901900181	El Menco	DM15-181J	1
C24	Same as C16				
C25	Same as C6				
C26	Same as C6				
C27	Same as C6				
CR1	DIODE, Germanium	910500003	Transitron	1N995	1
CR2	DIODE, Hot Carrier	910500069	H.P.	HPA 2900	4
CR3	Same as CR2				
CR4	Same as CR2				
CR5	Same as CR2				
CR6	DIODE, Zener, 8.5V, 1N764	910500035	Hoffman	1N764	1
CR7	VARICAP, V10	913600010	PSI	V10	1
L1	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	2
L2	Same as L1				
L3	INDUCTOR, Fixed, Molded, 24 μ H	909000121	Delevan	1537-46	1
L4	INDUCTOR, Variable, 0.39 μ H Nom.	909400061	Delevan	4450-07	1
Q1	TRANSISTOR, PNP, Silicon, 2N3640	910300047	Fairchild	2N3640	1
Q2	TRANSISTOR, NPN, Silicon, 2N3563	910300042	Fairchild	2N3563	4
Q3	Same as Q2				
Q4	Same as Q2				
Q5	Same as Q2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	19.1 MHz OSCILLATOR (Continued)		Sierra	C02461501	
R1	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		3
R2	Same as R1				
R3	Same as R1				
R4	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		4
R5	RESISTOR, Fixed Composition, 47K $\pm 5\%$, 1/4W	906900473	Speer		2
R6	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		8
R7	Same as R6				
R8	RESISTOR, Variable "Helitrim" Type 62PA, 500 Ω	907900231	Beckman Inst.	62PAR500	1
R9	RESISTOR, Fixed Composition, 100K $\pm 5\%$, 1/4W	906900104	Speer		3
R10	Same as R5				
R11	Same as R9				
R12	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		2
R13	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		5
R14	RESISTOR, Variable "Helitrim" Type 62PA, 20K	907900259	Beckman Inst.	62PAR20K	2
R15	RESISTOR, Fixed Composition, 18K $\pm 5\%$, 1/4W	906900183	Speer		1
R16	RESISTOR, Fixed Composition, 470K $\pm 5\%$, 1/4W	906900474	Speer		2
R17	RESISTOR, Fixed Composition, 47 $\pm 5\%$, 1/4W	906900470	Speer		1
R18	Same as R4				
R19	RESISTOR, Fixed Composition, 1500 $\pm 5\%$, 1/4W	906900152	Speer		1
R20	Same as R16				
R21	Same as R9				
R22	Same as R14				
R23	Same as R13				
R24	Same as R6				
R25	Same as R12				
R26	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R27	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		1
R28	Same as R4				
R29	Same as R4				
R30	Same as R6				
R31	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222	Speer		4
R32	RESISTOR, Fixed Composition, 820 $\pm 5\%$, 1/4W	906900821	Speer		1
R33	Same as R6				
R34	Same as R13				
R35	RESISTOR, Fixed Composition, 27K $\pm 5\%$, 1/4W	906900273	Speer		1
R36	Same as R13				
R37	Same as R13				
R38	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W		Speer		3
R39	Same as R6				
R40	Same as R6				
R41	Same as R6				
R42	Same as R38				
R43	Same as R38				
S1	SWITCH, Slide, Sub Miniature PC Mtg. SPDT	911000041	Cont.-Wirt	G124	1
T1	TRANSFORMER, Phase Discriminator	909900023	Stanford App. Eng.	A02460200	1
X1C1	SOCKET, Integrated Ckt, 8 Pin	914200050	Augat		1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>19.1 MHz OSCILLATOR (Continued)</u>				
Y1	CRYSTAL, 19.1 MHz Fund, Series Mode	912200039	Croven	A02455700	1
IC1	INTEGRATED CKT, μ A 709C	920300008	Fairchild	U5B770939X	1
	INSULATOR, Standoff Transistor	915100049	Regan	1932XM	6
	EJECTOR, P.C. Board	920400022	Scanbe	S-203	1
	P.C. BOARD	904500227		C02461400	1
A6	<u>19.0 MHz OSCILLATOR</u>		Sierra	C02461502	
	*Same as 19.1 MHz Oscillator except for Crystal (See A5)				
Y1	CRYSTAL, 19.0 MHz Fund, Series Mode	912200040	Croven	A02455600	1
A7	<u>COARSE TUNING OSCILLATOR</u>		Sierra	C02462600	
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
C2	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z5U0- 102P	2
C3	CAPACITOR, Dura Mica, 1000 pF $\pm$ 5%, 100V	901920102	El Menco	DM15-102J	2
C4	CAPACITOR, Variable Glass, .8-8.5 pF, P.C. Mtg.	903000885	Erie	563-013	1
C5	CAPACITOR, Tubular Ceramic, 10 pF $\pm$ 5%, N330	901430100	Centralab	TCA-10	1
C6	CAPACITOR, Dura Mica, 5 pF $\pm$ 10%, 500V	901900050	El Menco	DM15-050K	1
C7	CAPACITOR, Dura Mica, 3 pF $\pm$ 20%, 500V	901900030	El Menco	DM15-030K	1
C8	Same as C2				
C9	CAPACITOR, Dura Mica, 120 pF $\pm$ 5%, 500V	901900121	El Menco	DM15-121J	1
C10	CAPACITOR, Dura Mica, 150 pF $\pm$ 5%, 500V	901900151	El Menco	DM15-151J	1
C11	Same as C3				
CR1	VARICAP, V10	913600010	PSI	V10	1
L1	INDUCTOR, Variable, 0.157 μ H Nom.	909400059	Delevan	4450-02	1
P41	PLUG, Assembly	B02464900	Sierra	B02464900	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>COARSE TUNING OSCILLATOR (Continued)</u>				
Q1	TRANSISTOR, NPN, 2N3563	910300042	Fairchild	2N3563	1
R1	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		1
R2	RESISTOR, Fixed Composition, 5600 $\pm 5\%$, 1/4W	906900562	Speer		1
R3	RESISTOR, Fixed Composition, 680 $\pm 5\%$, 1/4W	906900681	Speer		1
R4	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391	Speer		1
R5	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		1
XQ1	SOCKET, Transistor, 3 Pin	914200036	Grayhill	22-16-3	1
	P.C. BOARD	904500233		C02462500	1
A8	<u>COARSE TUNING AMPLIFIER AND OUTPUT</u>		Sierra	C02462400	
C1	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z500-102P	18
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	Same as C1				
C10	Same as C1				
C11	CAPACITOR, Dura Mica, 27 pF $\pm 5\%$, 500V	901900270	El Menco	DM15-270J	1
C12	Same as C1				
C13	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	2
C14	Same as C13				
C15	Same as C1				
C16	Same as C1				
C17	Same as C1				
C18	Same as C1				
C19	Same as C1				
C20	Same as C1				
C21	Same as C1				
C22	CAPACITOR, Dura Mica, 5 pF $\pm 10\%$, 500V	901900050	El Menco	DM-15-050K	1
L1	INDUCTOR, Fixed Molded, 0.47 μ H $\pm 20\%$ 1/4W	909000126	Delevan	1537-06	2
L2	Same as L1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	COARSE TUNING AMPLIFIER AND OUTPUT (Continued)				
L3	INDUCTOR, Fixed Molded, 4.7 μ H, $\pm 10\%$	909000123	Delevan	1537-716	3
L4	INDUCTOR, Fixed Molded, 82 μ H	909000124	Delevan	1537-72	1
L5	INDUCTOR, Fixed Molded, 24 μ H	909000121	Delevan	1537-46	1
L6	Same as L3				
L7	Same as L3				
Q1	TRANSISTOR, NPN, Silicon, 2N3563	910300042	Fairchild	2N3563	2
Q2	Same as Q1				
Q3	TRANSISTOR, PNP, Silicon, 2N3640	910300047	Fairchild	2N3640	7
Q4	Same as Q3				
Q5	Same as Q3				
Q6	Same as Q3				
Q7	Same as Q3				
Q8	Same as Q3				
Q9	Same as Q3				
R1	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151	Speer		1
R2	RESISTOR, Fixed Composition, 47 $\pm 5\%$, 1/4W	906900470	Speer		1
R3	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		1
R4	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123	Speer		2
R5	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		10
R6	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222	Speer		2
R7	RESISTOR, Fixed Composition, 68 $\pm 5\%$, 1/4W	906900680	Speer		1
R8	Same as R5				
R9	RESISTOR, Variable Helitrim Type 62 PM, 500 Ω	907900231	Beckman Inst.	62PAR500	1
R10	Same as R4				
R11	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		2
R12	Same as R5				
R13	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Speer		1
R14	Same as R5				
R15	RESISTOR, Fixed Composition, 680 $\pm 5\%$, 1/4W	906900681	Speer		4
R16	Same as R5				
R17	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682	Speer		1
R18	Same as R11				
R19	Same as R5				
R20	Same as R5				
R21	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		4
R22	Same as R15				
R23	RESISTOR, Fixed Composition, 330 $\pm 5\%$, 1/4W	906900331	Speer		1
R24	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		1
R25	Same as R21				
R26	Same as R6				
R27	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391	Speer		1
R28	Same as R5				
R29	Same as R21				
R30	Same as R15				
R31	Same as R5				
R32	Same as R21				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	COARSE TUNING AMPLIFIER AND OUTPUT (Continued)				
R33	Same as R15				
R34	RESISTOR, Fixed Composition, 12 $\pm$ 5%, 1/4W	906900120	Speer		2
R35	Same as R5				
	INSULATOR, Standoff Transistor	915000049	Regan	1932XM	9
R36	Same as R34				
R37	RESISTOR, Fixed Composition, 22 $\pm$ 5%, 1/4W	906900220	Speer		2
R38	RESISTOR, Fixed Composition, 39 $\pm$ 5%, 1/4W	906900390	Speer		1
R39	Same as R37				
R40	RESISTOR, Fixed Composition, 27 $\pm$ 5%, 1/4W	906900270	Speer		1
	JACK PLUG, Combination	914800095	CTC	3310-2-03	4
	EJECTOR, P.C. Board	920400022	Scanbe	S-203	1
	P.C. BOARD	904500232		C02462300	1
A9	<u>MIXER</u>		Sierra	C02462100	
C1	CAPACITOR, Dura Mica, 100 pF $\pm$ 5%, 500V	901900101	El Menco	DM15-101J	1
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	3
C3	Same as C2				
C4	Same as C2				
C5	CAPACITOR, Variable Glass, .8-8.5 pF	903000835	Erie	563-013	2
C6	CAPACITOR, Dura Mica, 330 pF $\pm$ 5%, 500V	901900331	El Menco	DM15-331J	2
C7	CAPACITOR, Dura Mica, 5 pF $\pm$ 10%, 500V	901900050	El Menco	DM15-050K	1
C8	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
C9	CAPACITOR, Variable Trimmer, Max. C Seal Cap, 1-60 pF	903010600	JFD	MC626Y	1
C10	Same as C6				
C11	Same as C5				
CR1	DIODE, 1N995	910500033	Transitron	1N995	1
CR2	DIODE, "Hot Carrier", HPA2900	910500069	H.P.	HPA2900	2
CR3	Same as CR2				
Q1	TRANSISTOR, 2N2360, PNP	910300017	Philco	2N2360	1
R1	RESISTOR, Fixed Composition, 15K $\pm$ 5%, 1/4W	906900153	Speer		1
R2	RESISTOR, Fixed Composition, 4700 $\pm$ 5%, 1/4W	906900472	Speer		1
R3	RESISTOR, Fixed Composition, 1000 $\pm$ 5%, 1/4W	906900102	Speer		1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>MIXER</u> (Continued)				
R4	RESISTOR, Fixed Composition, 680 $\pm 5\%$, 1/4W	906900681	Speer		1
R5	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221	Speer		3
R6	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		1
R7	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		2
R8	Same as R5				
R9	RESISTOR, Variable Helitrim Type 62 PA, 500 Ω	907900231	Beckman Inst.	62PAR500	1
R10	Same as R7				
R11	Same as R5				
T1	TRANSFORMER, Pulse, 1:1CT PE5864	909900014	Pulse Eng.	PE5864	1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	1
	HANDLE, P. C. Board	920400021	Stoesser	C52528	1
	P. C. BOARD	904500231		C02462200	1
A10	<u>AMPLIFIER-DETECTOR</u>		Sierra	C02461900	
C1	CAPACITOR, Vert. Mtg. Plastic Encased Non-Polarized 10 μ F, 25V	903300106	Nashville Elec.	12-375BP 10-25S85NP	3
C2	CAPACITOR, Trans.-Lytic, 25 μ F, 25V	902230256	Sprague	TL1207	2
C3	Same as C1				
C4	CAPACITOR, Dura Mica, 1200 pF $\pm 5\%$, 500V	901900122	El Menco	DM19-122J	1
C5	Same as C1				
C6	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
C7	Same as C2				
CR1	DIODE, Silicon, 1N456	910500031	RCA	1N456	1
L1	INDUCTOR, Fixed, 10.0 mH $\pm 2\%$	909000117	J.W. Miller	70F102A1	1
L2	INDUCTOR, Fixed, 3.3 mH $\pm 10\%$	909000116	J.W. Miller	70F333A1	1
Q1	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild	2N3638	3
Q2	Same as Q1				
Q3	Same as Q1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>AMPLIFIER-DETECTOR (Continued)</u>				
R1	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		2
R2	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	Speer		1
R3	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		1
R4	Same as R1				
R5	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		1
R6	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R7	RESISTOR, Variable Helitrim Type 62 PA, 500 Ω	907900231	Beckman Inst.	62PAR500	1
R8	RESISTOR, Fixed Composition, 47 $\pm 5\%$, 1/4W	906900470	Speer		1
R9	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W	906900272	Speer		1
R10	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		1
R11	RESISTOR, Fixed Composition, 220K $\pm 5\%$, 1/4W	906900224	Speer		1
R12	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471	Speer		1
R13	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	3
	HANDLE, P. C. Board	920400021	Stoesser	C52528	1
	P. C. BOARD	904500230		C02462000	1
A11	<u>COARSE LOCK SENSOR</u>		Sierra	C02461700	
C1	CAPACITOR, Vert.Mtg., Plastic Encased Non-Polarized, 10 μ F, 25V	903300106	Nashville Elect.	12-375BP10- 25S85NP	1
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	2
C3	Same as C2				
C4	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	2
C5	CAPACITOR, Transi-Lytic, 25 μ F, 25V	902230256	Sprague	TL1207	1
C6	Same as C4				
C7	CAPACITOR, Vert.Mtg., Plastic Encased Non-Polarized, 1.0 μ F, 25V	903300105	Nashville Elect.	8-250BP1- 25S85NP	2
C8	Same as C7				
CR1	DIODE, Silicon, 1N456	910500031	RCA	1N456	1
FL1	FILTER, 50 kHz, Low-Pass	910100047	S.A.E.	A02149300	1
L1	INDUCTOR, Fixed Molded, 24 μ H	909000121	Delevan	1537-47	1
L2	INDUCTOR, Fixed, 3.3 mH	909000116	Miller	70F333A1	1
L3	INDUCTOR, RFC, 1000 μ H	909000130	Nytronics	Wee 1000	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>COARSE LOCK SENSOR (Continued)</u>				
Q1	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild	2N3638	2
Q2	Same as Q1				
Q3	TRANSISTOR, NPN, Silicon, 2N706B	910300024	Fairchild	2N706B	2
Q4	TRANSISTOR, NPN, 2N4265	910300075	Motorola	2N4265	1
R1	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	Speer		1
R2	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		3
R3	RESISTOR, Fixed Composition, 100K $\pm 5\%$, 1/4W	906900104	Speer		2
R4	Same as R2				
R5	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		4
R6	RESISTOR, Fixed Composition, 47 $\pm 5\%$, 1/4W	906900470	Speer		1
R7	Same as R3				
R8	Same as R2				
R9	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		1
R10	Same as R5				
R11	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R12	Same as R5				
R13	RESISTOR, Variable Helitrim Type 62 PA, 100K	907900230	Beckman Inst.	62PAR 100K	1
R14	RESISTOR, Fixed Composition, 120 $\pm 5\%$, 1/4W	906900121	Speer		1
R15	Same as R5				
R16	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682	Speer		1
R17	RESISTOR, Fixed Composition, 270 $\pm 5\%$, 1/4W	906900211	Speer		1
R18	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	3
	HANDLE, P. C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500228		C02461800	1
A12	<u>FINE TUNING OSCILLATOR & AMPLIFIER</u>		Sierra	C02461200	
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	5
C2	CAPACITOR, Tubular Ceramic, 10 pF, N330	901430100	Centralab	TCA10	1
C3	CAPACITOR, Tubular Ceramic, 39 pF, N150	901420390	Centralab	DA320U	1
C4	CAPACITOR, Tubular Ceramic, 150 pF, NPO	901400151	Centralab	TCZ150	1
C5	CAPACITOR, Dura Mica, 1500 pF $\pm 5\%$, 500V	901910152	El Menco	DM19-152J	1
C6	CAPACITOR, Tubular Ceramic, 22 pF, NPO	901420220	Centralab	TCZ22	1
C7	CAPACITOR, Tubular Ceramic, 39 pF, NPO	901410390	Centralab	TCZ39	1
C8	CAPACITOR, Variable Glass, .8-12 pF, P.C. Mtg.	903020120	Erie	565-013	1
C9	CAPACITOR, Vert. Mtg. NonPolarized, 10 μ F 25V Pl. Encased	903300106	Nashville Elect.	12-375BP 10- 25S85NP	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>FINE TUNING OSCILLATOR & AMPLIFIER</u> (Continued)				
C10	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	4
C11	CAPACITOR, Dura Mica, 4700 pF $\pm 5\%$, 500V	901900472	El Menco	DM19-472J	1
C12	Same as C10				
C13	CAPACITOR, Dura Mica, 220 pF $\pm 5\%$, 500V	901900221	El Menco	DM15-221J	1
C14	Same as C1				
C15	Same as C10				
C16	Same as C10				
C17	Same as C1				
C18	CAPACITOR, Transi-Lytic, 25 μ F, 25V	902230256	Sprague	TL1207	1
C19	Same as C1				
C20	Same as C1				
C21	CAPACITOR, Fixed Transi-Lytic, 1.0 μ F $\pm 10\%$ 35VDC	902700105	Texas Instrument	SCM-105FP0- 35D2	1
L1	INDUCTOR, Variable, 1.08 mH		Sierra	A01897300	1
L2	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	3
L3	Same as L2				
L4	INDUCTOR, Fixed Molded, 82 μ H	909000124	Delevan	1537-72	1
L5	Same as L2				
Q1	TRANSISTOR, 2N3641, NPN	910300044		2N3641	2
Q2	TRANSISTOR, 2N1728, PNP	910300008	Philco	2N1728	1
Q3	TRANSISTOR, 2N3638, PNP, Silicon	910300037	Fairchild	2N3638	2
Q4	Same as Q1				
Q5	Same as Q3				
R1	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		2
R2	RESISTOR, Fixed Composition, 82K $\pm 5\%$, 1/4W	906900823	Speer		1
R3	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		2
R4	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123	Speer		2
R5	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391	Speer		1
R6	RESISTOR, Variable, 25 Turn, Type RP 20K $\pm 20\%$	907900260	AB		1
R7	RESISTOR, Fixed Composition, 56 Ω $\pm 10\%$, 2W	906000560	AB		1
R8	RESISTOR, Fixed Composition, 33 Ω $\pm 5\%$, 2W	905800330	AB		1
R9	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		1
R10	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222	Speer		1
R11	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		1
R12	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560	Speer		1
R13	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151	Speer		1
R14	Same as R4				
R15	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	Speer		1
R16	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W	906900272	Speer		1
R17	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Speer		1
R18	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		1
R19	Same as R1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>FINE TUNING OSCILLATOR & AMPLIFIER</u> (Continued)				
R20	Same as R3				
R21	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471	Speer		1
R22	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	5
	EJECTOR, P. C. Board	920400022	Scanbe	S-203	1
	P.C. BOARD	904500226		C02461300	1
A13	<u>SECOND AMPLIFIER & PHASE DISCRIMINATOR</u>		Sierra	C02461100	
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM103	4
C2	CAPACITOR, Disc Mica, 150 pF $\pm 5\%$, 500V	901900151	El Menco	DM15-151J	1
C3	Same as C1				
C4	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	6
C5	CAPACITOR, Dura Mica, 120 pF $\pm 5\%$, 500V	901900121	El Menco	DM15-121J	1
C6	Same as C4				
C7	CAPACITOR, Vert. Mtg. Plastic Encased Non-Polarized, 10 μ F, 25V	903300106	Nashville Elec.	12-375BP 10-25S85NP	1
C8	Same as C4				
C9	Same as C4				
C10	Same as C1				
C11	Same as C4				
C12	CAPACITOR, Dura Mica, 470 pF $\pm 5\%$, 500V	901900471	El Menco	DM15-471J	1
C13	Same as C1				
C14	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z500-102P	1
C15	Same as C4				
CR1	DIODE, S555G (1N995)	910500003	Transitron	1N995	2
CR2	DIODE, Matched Pair, MP3507	910500009	Rheem	AE1043	1
CR3	Same as CR1				
CR4	Part of CR2				
L1	INDUCTOR, Fixed Molded 82 μ H	909000124	Delevan	1537-72	1
L2	INDUCTOR, Fixed, 330 μ H (Wee Ductor)	909000133	Nytronics	WEE330	2
L3	Same as L2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>SECOND AMPLIFIER & PHASE DISCRIMINATOR</u> (Continued)				
Q1 Q2	TRANSISTOR, PNP, 2N3638 Silicon Same as Q1	910300037	Fairchild	2N3638	2
R1	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		1
R2	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		2
R3	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W	906900272	Speer		1
R4	RESISTOR, Variable Type 62PA, 500 Ω Helitrim	907900231	Beckman Inst.	62PAR500	1
R5	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		1
R6	Same as R2				
R7	RESISTOR, Fixed Composition, 560 $\pm 5\%$, 1/4W	906900561	Speer		1
R8	RESISTOR, Variable, Type 62PA, 100K, Helitrim	907900230	Beckman Inst.	62PAR100K	1
R9	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Speer		1
R10	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		2
R11	RESISTOR, Variable 25 Turn Type RP, 10K	907900172	AB		1
R12	Same as R10				
R13	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391	Speer		1
T1	TRANSFORMER, Pulse, 1:4 CT PE5667	909900017	Pulse Eng.	PE5667	1
T2	TRANSFORMER, Pulse, 1:10 CT PE5643	909900016	Pulse Eng.	PE5643	1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	2
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500225		C02361100	1
A14	<u>FINE LOCK SENSOR</u>		Sierra	C02460800	
C1	CAPACITOR, Vert. Mtg. Plastic Encased Non-Polarized, 1.0 μ F, 25V	903300105	Nashville Elect.	8-250BP 1- 25S85NP	1
C2	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	2
C3	CAPACITOR, Vert. Mtg. Plastic Encased, Non-Polarized, 10 μ F, 25V	903300106	Nashville Elect.	12-375BP 10- 25S85NP	1
C4	Same as C2				
C5	CAPACITOR, Vert. Mtg. Plastic Encased, Non-Polarized, 1 μ F, 25V	903300105	Nashville Elect.	8-250BP 1- 25S85NP	1
C6	CAPACITOR, Transi-Lytic 25 μ F, 25V	902230256	Sprague	TL1207	1
C7	CAPACITOR, Fixed Tantalytic, 1.0 μ F $\pm 10\%$, 35V dc	902700105	Texas Instrument	SCM-105FP035D2	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>FINE LOCK SENSOR</u> (Continued)				
CR1	DIODE, 1N815	910500010	Transitron	1N815	1
FL1	FILTER, 125 kHz, Low-Pass	910100048	S.A.E.10121	A02087800	1
K1	RELAY, 5.8 mA dc P.C. Mtg., SPDT, 1A Contacts	912600026	Sigma	11FP-1500G-SIL	1
L1	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	1
Q1	TRANSISTOR, 2N706A, NPN	910300022	Motorola	2N706A	2
Q2	TRANSISTOR, NPN, 2N3565, Silicon	910300046	Fairchild	2N3565	1
Q3	Same as Q1				
R1	RESISTOR, Fixed Composition, 5600 $\pm 5\%$, 1/4W	906900562	Speer		1
R2	RESISTOR, Fixed Composition, 220K $\pm 5\%$, 1/4W	906900224	Speer		1
R3	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		1
R4	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Speer		1
R5	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682	Speer		1
R6	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151	Speer		1
R7	RESISTOR, Fixed Composition, 1500 $\pm 5\%$, 1/4W	906900152	Speer		1
R8	RESISTOR, Fixed Composition, 18K $\pm 5\%$, 1/4W	906900183	Speer		1
R9	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	3
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500224		C02360900	1
A15	<u>SECOND OSCILLATOR</u>		Sierra	C02460600	
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DPM103	13
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, Tubular Ceramic, 10 pF, NPO	901420100	Centralab	TCZ10	1
C5	CAPACITOR, Tubular Ceramic, 150 pF, NPO	901400151	Centralab	TCZ150	1
C6	CAPACITOR, Tubular Ceramic, 30 pF, N330	901410300	Centralab	SS15625-1	1
C7	CAPACITOR, Tubular Ceramic, 120 pF, NPO	901410121	Centralab	TCZ120	1
C8	Same as C1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
<u>SECOND OSCILLATOR</u> (Continued)					
C9	CAPACITOR, Dura Mica, 10 pF $\pm 5\%$, 500V	901900100	El Menco	DM15-100J	4
C10	Same as C1				
C11	Same as C1				
C12	Same as C1				
C13	Same as C9				
C14	Same as C1				
C15	Same as C1				
C16	Not Used				
C17	Same as C9				
C18	Same as C1				
C19	Same as C1				
C20	Not Used				
C21	Same as C9				
C22	Same as C1				
C23	Same as C1				
C24	CAPACITOR, Dura Mica, 56 pF $\pm 5\%$, 500V	901900560	El Menco	DM15-560J	1
CR1	VARICAP, V10	913600010	PSI	V10	1
L1	INDUCTOR, Variable, 2.2 μ H Nom.	909400058	Delevan	4450-16	1
L2	INDUCTOR, Fixed Molded, 24 μ H	909000121	Delevan	1537-46	1
L3	INDUCTOR, Fixed Molded, 4.7 μ H $\pm 10\%$	909000123	Delevan	1537-716	3
L4	Same as L3				
L5	Same as L3				
L6	INDUCTOR, Fixed Molded, 0.47 μ H $\pm 20\%$, 1/4W	909000126	Delevan	1537-06	1
Q1	TRANSISTOR, NPN Silicon, 2N706B	910300024	Fairchild	2N706B	1
Q2	TRANSISTOR, PNP Silicon, 2N3640	910300047	Fairchild	2N3640	1
Q3	TRANSISTOR, NPN Silicon, 2N3563	910300042	Fairchild	2N3563	3
Q4	Same as Q3				
Q5	Same as Q3				
R1	RESISTOR, Fixed Composition, 100K $\pm 5\%$, 1/4W	906900104	Speer	62PAR20K	1
R2	RESISTOR, Variable, Type 62PAR20K	907900259	Beckman Inst.		1
R3	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R4	RESISTOR, Fixed Composition, 120K $\pm 5\%$, 1/4W	906900124	Speer		2
R5	Same as R4				
R6	RESISTOR, Fixed Composition, 220K $\pm 5\%$, 1/4W	906900224	Speer		1
R7	RESISTOR, Fixed Composition, 5600 $\pm 5\%$, 1/4W	906900562	Speer		1
R8	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		1
R9	RESISTOR, Fixed Composition, 680 $\pm 5\%$, 1/4W	906900681	Speer		1
R10	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391	Speer		1
R11	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		2
R12	RESISTOR, Fixed Composition, 27K $\pm 5\%$, 1/4W	906900273	Speer		2
R13	Same as R12				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>SECOND OSCILLATOR (Continued)</u>				
R14	Same as R11				
R15	RESISTOR, Fixed Composition, 18K $\pm 5\%$, 1/4W	906900183	Speer		3
R16	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		2
R17	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Speer		2
R18	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560	Speer		2
R19	Same as R15				
R20	Same as R16				
R21	Same as R17				
R22	Same as R18				
R23	RESISTOR, Fixed Composition, 1500 $\pm 5\%$, 1/4W	906900152	Speer		1
R24	RESISTOR, Fixed Composition, 820 $\pm 5\%$, 1/4W	906900821	Speer		1
R25	Same as R15				
R26	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		2
R27	RESISTOR, Fixed Composition, 1800 $\pm 5\%$, 1/4W	906900182	Speer		1
R28	Same as R26				
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	5
	HANDLE, P. C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500223		C02460700	1
A16	<u>REFERENCE MIXER</u>		Sierra	C02460500	
C1	CAPACITOR, Variable Glass .8-8.5 pF P.C. Mtg.	903000885	Erie	563-013	1
C2	CAPACITOR, Dura Mica, 5 pF $\pm 10\%$, 500V	901900050	El Menco	DM15-050K	1
C3	CAPACITOR, Dura Mica, 330 pF $\pm 5\%$, 500V	901900331	El Menco	DM15-331J	5
C4	Same as C3				
C5	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM103	4
C6	CAPACITOR, Dura Mica, 1000 pF $\pm 5\%$, 100V	901920102	El Menco	DM15-102J	1
C7	Same as C5				
C8	CAPACITOR, Dura Mica, 270 pF $\pm 5\%$, 500V	901900271	El Menco	DM15-271J	1
C9	Same as C5				
C10	CAPACITOR, Dura Mica, 220 pF $\pm 5\%$, 500V	901900221	El Menco	DM15-221J	1
C11	Same as C5				
C12	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
C13	Same as C3				
C14	Same as C3				
C15	Same as C3				
C16	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z500-102P	1
CR1	DIODE, Matched Pair MP3507	910500009	Rheem	AE1043	1
CR2	Same as CR1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	REFERENCE MIXER (Continued)				
L1	INDUCTOR, Variable, .47 μ H, Nominal	909400060	Delevan	4450-08	1
L2	INDUCTOR, Fixed Molded, 24 μ H	909000121	Delevan	1537-46	1
Q1	TRANSISTOR, NPN, 2N699, Silicon	910300013	Fairchild	2N699	1
Q2	TRANSISTOR, NPN, 2N3563, Silicon	910300042	Fairchild	2N3563	1
Q3	TRANSISTOR, PNP, 2N3640, Silicon	910300047	Fairchild	2N3640	1
R1	RESISTOR, Variable, 25 Turn Type R, 500 Ω	907900102	AB		1
R2	RESISTOR, Fixed Composition, 220 $\pm$ 5%, 1/4W	906900221	Speer		2
R3	Same as R2				
R4	RESISTOR, Fixed Composition, 10K $\pm$ 5%, 1/4W	906900103	Speer		2
R5	Same as R4				
R6	RESISTOR, Fixed Composition, 330 $\pm$ 5%, 1/2W	905000331	AB		1
R7	RESISTOR, Fixed Composition, 15K $\pm$ 5%, 1/4W	906900153	Speer		3
R8	RESISTOR, Fixed Composition, 22K $\pm$ 5%, 1/4W	906900223	Speer		2
R9	RESISTOR, Fixed Composition, 1000 $\pm$ 5%, 1/4W	906900102	Speer		1
R10	RESISTOR, Fixed Composition, 47 $\pm$ 5%, 1/4W	906900470	Speer		2
R11	Same as R7				
R12	Same as R8				
R13	RESISTOR, Fixed Composition, 680 $\pm$ 5%, 1/4W	906900681	Speer		1
R14	Same as R10				
R15	RESISTOR, Fixed Composition, 470 $\pm$ 5%, 1/4W	906900471	Speer		1
R16	RESISTOR, Fixed Composition, 1800 $\pm$ 5%, 1/4W	906900182	Speer		1
R17	Same as R7				
R18	RESISTOR, Fixed Composition, 18K $\pm$ 5%, 1/4W	906900183	Speer		1
T1	TRANSFORMER, Pulse (1:1) PE5864	909900014	Pulse Eng.	PE5864	1
	INSULATOR, Standoff, Transistor	915100049	Regan	1932XM	3
	HANDLE, P.C. Board	920400021	Stoesser	C52528	1
	P.C. BOARD	904500222		C02460500	1
A20	40-73 MHz $\div$ 100		Sierra	C02464800	
C1	CAPACITOR, Ceramic, .01 μ F, 150VDC	901440103	Centralab	DDM-103	1
C2	CAPACITOR, Tantalum, 10 μ F, 10VDC	902750106	Kemet	K10P10K	1
C3	CAPACITOR, Ceramic, .01 μ F, 200VDC	901480103	Vitramon	CK06W103K	2
C4	Same as C3				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>40-73 MHz $\pm$ 100 (Continued)</u>				
IC1	INTEGRATED CIRCUIT, Hi Speed Gate, SC2147F to - 86 Flat Pack	920300012	Motorola	SC2147F	1
IC2	INTEGRATED CIRCUIT, Hi Speed F/F, MC1013P	920300013	Motorola	MC1013P	8
IC3	Same as IC2				
IC4	Same as IC2				
IC5	Same as IC2				
IC6	Same as IC2				
IC7	Same as IC2				
IC8	Same as IC2				
IC9	Same as IC2				
IC10	INTEGRATED CIRCUIT, Translator, MC367G	920300014	Motorola	MC367G	1
IC11	INTEGRATED CIRCUIT, Bias Driver, MC354G	920300015	Motorola	MC354G	1
R1	RESISTOR, Fixed Composition 560 $\pm$ 5%, 1/4W	906900561	Speer		1
R2	RESISTOR, Fixed Composition 150 $\pm$ 5%, 1/4W	906900151	Speer		1
R3	RESISTOR, Fixed 7.5 Ω , 2-1/4W	906200075	Ohmite	3886	1
R4	RESISTOR, Fixed Composition 100 $\pm$ 5%, 1/4W	906900101	Speer		1
R5	RESISTOR, Fixed Composition 680 $\pm$ 5%, 1/4W	906900681	Speer		1
	EJECTOR, P.C. Board	920400022	Scanbe	S-203	1
	P.C. BOARD	904500254		C02464700	1
A22	<u>CONTROL LOGIC #2</u>		Sierra	C024464400	1
C1	CAPACITOR, Ceramic, 0.1 μ F $\pm$ 20%, 50VDC	901420104	Gulton Ind.	CK16M-104M	2
C2	Same as C1				
IC1	INTEGRATED CIRCUIT, Dual J-K F/F MC790P	920300016	Motorola	MC790P	4
IC2	Same as IC1				
IC3	INTEGRATED CIRCUIT, Triple 3 Input Gate MC792CP	920300020	Motorola	MC792P	1
IC4	INTEGRATED CIRCUIT, Hex Inverter MC789P	920300019	Motorola	MC789P	1
IC5	INTEGRATED CIRCUIT, Quad 2 Input Gate MC724P	920300017	Motorola	MC724P	2
IC6	Same as IC1				
IC7	Same as IC5				
IC8	Same as IC1				
IC9	INTEGRATED CIRCUIT, Dual Buffer MC788P	920300022	Motorola	MC788P	1
R1	RESISTOR, Fixed Composition, 3900 $\pm$ 5%, 1/4W	906900392	Speer		1
R2	RESISTOR, Fixed Composition, 1500 $\pm$ 5%, 1/4W	906900152	Speer		1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>CONTROL LOGIC #2 (Continued)</u>				
R3	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R4	RESISTOR, Fixed Composition, 270 $\pm 5\%$, 1/4W	906900271	Speer		1
	EJECTOR, P. C. Board	920400022	Scanbe	S-203	1
A23	<u>CONTROL LOGIC #1</u>		Sierra	C02464100	1
IC1	INTEGRATED CIRCUIT, Dual J-K F/F, MC790P	920300016	Motorola	MC790P	4
IC2	Same as IC1				
IC3	Same as IC1				
IC4	INTEGRATED CIRCUIT, Triple 3 Input Gate MC792P	920300020	Motorola	MC792P	1
IC5	INTEGRATED CIRCUIT, Hex Inverter, MC789P	920300019	Motorola	MC789P	1
IC6	Same as IC1				
IC7	INTEGRATED CIRCUIT, Quad 2 Input Gate MC724P	920300017	Motorola	MC724P	2
IC8	INTEGRATED CIRCUIT, Dual Buffer, MC788P	920300022	Motorola	MC788P	1
IC9	Same as IC7				
	EJECTOR, P.C. Board	920400022	Scanbe	S-203	1
A24	<u>MODE DECADE</u>		Sierra	C02487900	1
IC1	INTEGRATED CIRCUIT, Dual J-K F/F, MC790P	920300016	Motorola	MC790P	4
IC2	Same as IC1				
IC3	Same as IC1				
IC4	Same as IC1				
IC5	INTEGRATED CIRCUIT, Triple 3 Input Gate, MC792P	920300020	Motorola	MC792P	2
IC6	Same as IC5				
Q1	TRANSISTOR, NPN, 2N4265	910300073	Motorola	2N4265	7
Q2	Same as Q1				
Q3	Same as Q1				
Q4	Same as Q1				
Q5	Same as Q1				
Q6	Same as Q1				
Q7	Same as Q1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	MODE DECADE (Continued)				
	EJECTOR, P.C. BOARD	920400022	Scanbe	S-203	1
A25	DECADE DIVIDER (1-7) 7 BOARDS PER INSTRUMENT		Sierra	C02487900	7
IC1	INTEGRATED CIRCUIT, Dual J-K F/F, MC790P	920300016	Motorola	MC790P	4
IC2	Same as IC1				
IC3	INTEGRATED CIRCUIT, Quad 2 Input Gate, MC724P	920300017	Motorola	MC724P	1
IC4	INTEGRATED CIRCUIT, Dual 4 Input Gate, MC725P	920300018	Motorola	MC725P	1
IC5	INTEGRATED CIRCUIT, Triple 3 Input Gate, MC792P	920300020	Motorola	MC792P	2
IC6	Same as IC1				
IC7	Same as IC1				
IC8	Same as IC5				
Q1	TRANSISTOR, NPN, 2N4265	910300073	Motorola	2N4265	14
Q2	Same as Q1				
Q3	Same as Q1				
Q4	Same as Q1				
Q5	Same as Q1				
Q6	Same as Q1				
Q7	Same as Q1				
Q8	Same as Q1				
Q9	Same as Q1				
Q10	Same as Q1				
Q11	Same as Q1				
Q12	Same as Q1				
Q13	Same as Q1				
Q14	Same as Q1				
R1	RESISTOR, Fixed Composition, 680Ω ±5%, 1/4W	906900681	Speer		4
R2	Same as R1				
R3	Same as R1				
R4	Same as R1				
	EJECTOR, P.C. Board	920400022	Scanbe	S-203	1

SECTION V

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC OPERATION
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>THIRD MODULATOR AND GAIN REFERENCE</u>				
A01	ASSEMBLY, Third Modulator and Gain Reference	C02418100	Sierra	C02418100	1
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	2
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	5
C3	CAPACITOR, Dura Mica, 560 pF $\pm$ 5%, 500V	901900561	El Menco	DM15-561J	1
C4	Same as C1				
C5	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z5U0-102P	1
C6	Same as C2				
C7	Same as C2				
C8	CAPACITOR, Dura Mica, 120 pF, $\pm$ 5%, 500V	901900121	El Menco	DM15-121J	2
C9	Same as C8				
C10	Same as C2				
C11	Same as C2				
C12	CAPACITOR, Dura Mica, 5 pF $\pm$ 10%, 500V	901900050	El Menco	DM15-050K	2
C13	CAPACITOR, Variable Glass, PC Mtg. 0.8-8.5 pF	903000885	Erie	563-013	2
C14	Same as C13				
C15	Same as C12				
CR1	DIODE, HD1871E	910500033	Hughes	HD1871E	2
CR2	Same as CR1				
L1	INDUCTOR, Fixed, 47 μ H $\pm$ 5%, 50 mA	909000107	Miller	70F475A1	1
L2	INDUCTOR, Variable, 1.0 μ H $\pm$ 10%	909400065	Delevan	4450-12	1
L3	INDUCTOR, Fixed, 68 μ H	909000131	Nytronics	WEE-68	1
Q1	TRANSISTOR, Silicon, NPN, 2N3563	910300042	Fairchild	2N3563	4
Q2	Same as Q1				
Q3	Same as Q1				
Q4	Same as Q1				
Q5	TRANSISTOR, Silicon, NPN, 2N3641	910300044	Fairchild	2N3641	1
R1	RESISTOR, Fixed Composition, 3300 $\pm$ 5%, 1/4W	906900332			3
R2	RESISTOR, Fixed Composition, 33K $\pm$ 5%, 1/4W	906900333			2
R3	RESISTOR, Fixed Composition, 33 $\pm$ 5%, 1/4W	906900330			2
R4	RESISTOR, Fixed Composition, 2200 $\pm$ 5%, 1/4W	906900222			2
R5	Same as R1				
R6	Same as R1				
R7	Same as R2				
R8	RESISTOR, Fixed Composition, 820 $\pm$ 5%, 1/4W	906900821			1
R9	Same as R3				
R10	Same as R4				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>THIRD MODULATOR AND GAIN REFERENCE</u> (Continued)				
R11	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471	Beckman Inst.	62 PAR 2K	2
R12	RESISTOR, Fixed Composition, 27 $\pm 5\%$, 1/4W	906900270			1
R13	RESISTOR, Variable 2K, Helitrim Type 62PA	907900228			1
R14	RESISTOR, Fixed Composition, 1.2K $\pm 5\%$, 1/4W	906900122			1
R15	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560			1
R16	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223			2
R17	Same as R16				
R18	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221			2
R19	RESISTOR, Fixed Composition, 15K $\pm 5\%$, 1/4W	906900153			1
R20	RESISTOR, Fixed Composition, 5600 $\pm 5\%$, 1/4W	906900562			1
R21	Same as R18				
R22	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123			3
R23	Same as R22				
R24	Same as R22				
R25	Same as R11				
R26	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151	Beckman Inst.	62 PAR 500	2
R27	Same as R26				
R28	RESISTOR, Variable, 500 Ω Helitrim Type 62 PA	907900231			1
R29	RESISTOR, Fixed Composition, 270 $\pm 5\%$, 1/4W	906900271			2
R30	Same as R29				
R31	RESISTOR, Fixed Composition, 56K $\pm 5\%$, 1/4W	906900563			2
R32	Same as R31				
T1	TRANSFORMER, Pulse, PE5864	909900014	Pulse Eng.	PE 5864	1
Y1	CRYSTAL, 1.000 MHz	912200026	Wright	A01896600	1
	<u>FIRST MODULATOR AND I.F.</u>				
A02	ASSEMBLY, First Modulator and I.F.	C02418200	Sierra Relcom	C02418200	1
A1	BALANCED MIXER, P.C. Mtg.	919900028		M-6	1
C1	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z5U0-102P	3
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, Dura Mica, 68 pF $\pm 5\%$, 500V	901900680	El Menco	DM15-680J	2
C5	Same as C4				
C6	CAPACITOR, Dura Mica, 33 pF $\pm 5\%$, 500V	901900330	El Menco	DM15-330J	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>FIRST MODULATOR AND I.F. (Continued)</u>				
C7	CAPACITOR, Dura Mica, 91 pF $\pm 5\%$, 500V	901910910	El Menco	DM15-910J	1
C8	CAPACITOR, Dura Mica, 56 pF $\pm 5\%$, 500V	901900560	El Menco	DM15-560J	1
C9	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	3
C10	Same as C9				
C11	Same as C9				
L1	INDUCTOR, Variable, 0.25-0.38 μ H PC Mtg.	909400069	Delevan	4000-02	3
L2	INDUCTOR, Fixed, 4.7 μ H, $\pm 10\%$	909000123	Delevan	1537-716	3
L3	Same as L2				
L4	Same as L2				
L5	Same as L1				
L6	INDUCTOR, Fixed, 10 μ H $\pm 10\%$	909000132	Miller	9240-720	1
L7	Same as L1				
L8	INDUCTOR, Fixed, 24 μ H, Molded	909000121	Delevan	1537-46	1
Q1	TRANSISTOR, Silicon, NPN, 2N3563	910300042	Fairchild	2N3563	2
Q2	Same as Q1				
R1	RESISTOR, Fixed Composition, 75 $\pm 5\%$, 1/4W	906900750			1
R2	RESISTOR, Fixed Composition, 10 $\pm 5\%$, 1/4W	906900100			1
R3	RESISTOR, Fixed Composition, 68 $\pm 5\%$, 1/4W	906900680			2
R4	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223			1
R5	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822			1
R6	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103			1
R7	Same as R3				
R8	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123			3
R9	Same as R8				
R10	Same as R8				
R11	RESISTOR, Fixed Composition, 1500 $\pm 5\%$, 1/4W	906900152			1
R12	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471			1
R13	RESISTOR, Fixed Composition, 180 $\pm 5\%$, 1/4W	906900181			1
	<u>L.O. AMPLIFIER</u>				
A03	ASSEMBLY, L.O. Amplifier	C02418300	Sierra	C02418300	1
C1	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z5U0-102P	5
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	6

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>L.O. AMPLIFIER (Continued)</u>				
C3	Same as C2				
C4	Same as C1				
C5	CAPACITOR, Dura Mica, 30 pF $\pm 2\%$, 500V	901900300	El Menco	DM15-300G	2
C6	Same as C2				
C7	Same as C1				
C8	Same as C2				
C9	Same as C1				
C10	Same as C2				
C11	CAPACITOR, Glass Piston, PC Mtg. 0.8-8.5 pF	903000885	Erie	563-013	1
C12	Same as C5				
C13	Same as C1				
C14	Same as C2				
C15	CAPACITOR, Dura Mica, 56 pF $\pm 2\%$, 500V	901900560	El Menco	DM15-560J	1
CR1	DIODE, Silicon, 1N456	910500031	RCA	1N456	3
CR2	Same as CR1				
CR3	Same as CR1				
L1	INDUCTOR, Fixed, Molded 0.47 μ H	909000126	Delevan	1537-06	1
L2	INDUCTOR, Fixed, Molded 1.0 μ H	909400067	Delevan	1537-12	1
L3	INDUCTOR, Fixed, Molded 24 μ H	909000121	Delevan	1537-46	1
Q1	TRANSISTOR, Silicon, NPN, 2N3563	910300042	Fairchild	2N3563	3
Q2	Same as Q1				
Q3	TRANSISTOR, Silicon, PNP, 2N3640	910300047	Fairchild	2N3640	4
Q4	Same as Q3				
Q5	Same as Q1				
Q6	Same as Q3				
Q7	Same as Q3				
R1	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560	Speer		1
R2	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		1
R3	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		4
R4	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221	Speer		1
R5	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		1
R6	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222	Speer		2
R7	RESISTOR, Fixed Composition, 680 $\pm 5\%$, 1/4W	906900681	Speer		1
R8	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		5
R9	Same as R3				
R10	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682	Speer		1
R11	Same as R8				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>L.O. AMPLIFIER (Continued)</u>				
R12	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471	Speer		1
R13	RESISTOR, Fixed Composition, 47 $\pm 5\%$, 1/4W	906900470	Speer		3
R14	RESISTOR, Fixed Composition, 560 $\pm 5\%$, 1/4W	906900561	Speer		1
R15	Same as R8				
R16	RESISTOR, Fixed Composition, 15K $\pm 5\%$, 1/4W	906900153	Speer		2
R17	Same as R16				
R18	Same as R8				
R19	RESISTOR, Fixed Composition, 68 Ω $\pm 5\%$, 1/4W	906900680	Speer		1
R20	Same as R13				
R21	Same as R8				
R22	RESISTOR, Fixed Composition, 470K $\pm 5\%$, 1/4W	906900474	Speer		1
R23	Same as R6				
R24	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	Speer		2
R25	Same as R24				
R26	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332	Speer		1
R27	Same as R3				
R28	Same as R3				
	<u>SECOND MODULATOR AND IF OUTPUT AMPL.</u>				
A04	ASSEMBLY, Second Modulator and IF Output Ampl.	C02418400	Sierra	C02418400	1
C1	CAPACITOR, Disc Ceramic, .001 μ F, 500V	901400102	Erie	831-000-Z5U0-102P	4
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	8
C3	Same as C2				
C4	CAPACITOR, Dura Mica, 56 pF, $\pm 5\%$, 500V	901900560	El Menco	DM15-560J	2
C5	Same as C1				
C6	Same as C2				
C7	CAPACITOR, Variable Glass PC Mtg. 0.8-8.5 pF	903000885	Erie	563-013	2
C8	CAPACITOR, Dura Mica, 5 pF, $\pm 10\%$, 500V	901900050	El Menco	DM15-050K	2
C9	Same as C8				
C10	Same as C7				
C11	CAPACITOR, Dura Mica, 8 pF, $\pm 10\%$, 500V	901900080	El Menco	DM15-080K	1
C12	Same as C1				
C13	Same as C2				
C14	Same as C2				
C15	Same as C4				
C16	Same as C1				
C17	Same as C2				
C18	Same as C2				
C19	Same as C2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>SECOND MODULATOR AND IF OUTPUT AMPL.</u> (Continued)				
CR1	DIODE, HD1871E	910500033	Hughes	HD1871E	2
CR2	Same as CR1				
CR3	DIODE, Silicon, 1N995	910500003	Transitron	1N995	1
L1	INDUCTOR, Fixed, 68 μ H	909000131	Nytronics	WEE68	2
L2	INDUCTOR, Variable, 1.0 μ H, $\pm 10\%$	909400065	Delevan	4450-12	2
L3	INDUCTOR, Fixed, 1.0 μ H	909400067	Delevan	1537-12	1
L4	Same as L1				
L5	Same as L2				
Q1	TRANSISTOR, Silicon, NPN, 2N3563	910300042	Fairchild	2N3563	5
Q2	Same as Q1				
Q3	TRANSISTOR, Silicon, NPN, 2N3641	910300044	Fairchild	2N3641	1
Q4	Same as Q1				
Q5	Same as Q1				
Q6	Same as Q1				
R1	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560			1
R2	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223			4
R3	Same as R2				
R4	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221			3
R5	RESISTOR, Fixed Composition, 15K $\pm 5\%$, 1/4W	906900153			2
R6	RESISTOR, Fixed Composition, 5600 $\pm 5\%$, 1/4W	906900562			1
R7	Same as R4				
R8	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123			6
R9	Same as R8				
R10	Same as R8				
R11	RESISTOR, Fixed Composition, 470 $\pm 5\%$, 1/4W	906900471			1
R12	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151			2
R13	Same as R12				
R14	RESISTOR, Variable 500 Helitrim Type 62 PA	907900231	Beckman Instr.	62 PAR 500	1
R15	RESISTOR, Fixed Composition, 270 $\pm 5\%$, 1/4W	906900271			2
R16	Same as R15				
R17	RESISTOR, Fixed Composition, 56K $\pm 5\%$, 1/4W	906900563			2
R18	Same as R17				
R19	Same as R2				
R20	Same as R2				
R21	Same as R4				
R22	Same as R5				
R23	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822			1
R24	RESISTOR, Variable, 200 Ω Helitrim Type 62 PA	907900233	Beckman Instr.	62 PAR 200	1
R25	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>SECOND MODULATOR AND IF OUTPUT AMPL.</u> (Continued)				
R26	Same as R8				
R27	Same as R8				
R28	Same as R8				
R29	RESISTOR, Fixed Composition, 1800 $\pm 5\%$, 1/4W	906900182			1
R30	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101			1
T1	TRANSFORMER, Pulse, PE5864	909900014	Pulse Eng.	PE5864	1
	<u>SECOND MIXER AND I.F.</u>				
A05	ASSEMBLY, Second Mixer and I.F.	C02418500	Sierra	C02418500	1
C1	CAPACITOR, Disc Ceramic, .001 GMV, 500V	901400102	Erie	831-000-Z5U0 -102P	3
C2	CAPACITOR, Disc Ceramic, .01, 150V	901440103	Centralab	DDM-103	6
C3	Same as C2				
C4	Same as C2				
C5	CAPACITOR, Dura Mica, 27 pF, $\pm 5\%$, 500V	901900270	El Menco	DM15-270J	5
C6	Same as C5				
C7	CAPACITOR, Dura Mica, 560 pF, $\pm 5\%$, 500V	901900561	El Menco	DM15-561J	1
C8	Same as C5				
C9	Same as C5				
C10	CAPACITOR, Dura Mica, 620 pF $\pm 2\%$, 300V	901900621	El Menco	DM15-621G	1
C11	Same as C5				
C12	CAPACITOR, Dura Mica, 30 pF $\pm 2\%$, 500V	901900300	El Menco	DM15-300G	1
C13	CAPACITOR, Dura Mica, 33 pF $\pm 5\%$, 500V	901910330	El Menco	DM15-330J	1
C14	Same as C2				
C15	Same as C1				
C16	Same as C2				
C17	Same as C2				
L1	INDUCTOR, Variable, 0.83-1.6 μ H	909400066	Delevan	4000-10	3
L2	Same as L1				
L3	Same as L1				
L4	INDUCTOR, Fixed, 68 μ H, $\pm 5\%$	909000131	Nytronics	WEE68	1
Q1	TRANSISTOR, PNP Silicon, 2N3640	910300047	Fairchild	2N3640	1
Q2	TRANSISTOR, NPN Silicon, 2N3563	910300042	Fairchild	2N3563	2
Q3	Same as Q2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
<u>SECOND MIXER AND I.F. (Continued)</u>					
R1	RESISTOR, Fixed Composition, 22K $\pm 5\%$, 1/4W	906900223			1
R2	RESISTOR, Fixed Composition, 15K $\pm 5\%$, 1/4W	906900153			1
R3	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560			1
R4	Not Used				
R5	RESISTOR, Fixed Composition, 18K $\pm 5\%$, 1/4W	906900183			1
R6	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472			1
R7	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102			2
R8	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123			1
R9	RESISTOR, Fixed Composition, 10K $\pm 5\%$, 1/4W	906900103			3
R10	RESISTOR, Fixed Composition, 270 $\pm 5\%$, 1/4W	906900271			1
R11	Same as R9				
R12	Same as R7				
R13	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221			1
R14	Same as R9				
<u>THIRD MIXER AND I.F.</u>					
A06	ASSEMBLY, Third Mixer and I.F.	C02418600	Sierra	C02418600	1
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	10
C2	Same as C1				
C3	CAPACITOR, Dura Mica, 47 pF $\pm 5\%$, 500V	901900470	El Menco	DM15-470J	1
C4	CAPACITOR, Dura Mica, 560 pF $\pm 5\%$, 500V	901900561	El Menco	DM15-561J	1
C5	CAPACITOR, Vert. Mtg. Plastic Encased, 1.0 μ F, 250V Non Polarized	903300105	Nashville Elect.	8-250BP1- 25S85 NP	1
C6	CAPACITOR, Disc Ceramic, 0.1 μ F, $\pm 5\%$, 50V	901410104	Sprague	33C41	4
C7	Same as C6				
C8	CAPACITOR, Dura Mica, 75 pF $\pm 5\%$, 500V	901900750	El Menco	DM15-750J	1
C9	CAPACITOR, Dura Mica, 220 pF $\pm 5\%$, 500V	901900221	El Menco	DM15-221J	1
C10	Same as C1				
C11	CAPACITOR, Dura Mica, 220 pF $\pm 5\%$, 500V	901900221	El Menco	DM15-221J	1
C12	Same as C6				
C13	Same as C6				
C14	Same as C1				
C15	Same as C1				
C16	Same as C1				
C17	Same as C1				
C18	Same as C1				
C19	Same as C1				
K1	RELAY, Reed SPDT, PC Mtg.	912600053	Winelco	PC-1C-12M	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>THIRD MIXER AND I.F. (Continued)</u>				
L1	INDUCTOR, Fixed, 1 μ H	909400067	Delevan	1537-12	1
L2	INDUCTOR, Variable, 82 μ H $\pm$ 20%	909400063	Delevan	4450-35	2
L3	INDUCTOR, Fixed, 68 μ H $\pm$ 5%	909000131	Nytronics	WEE 68	1
L4	Same as L2				
L5	INDUCTOR, Fixed, 24 μ H Moulded	909000121	Delevan	1537-46	1
Q1	TRANSISTOR, PNP Silicon, 2N3640	910300047	Fairchild	2N3640	4
Q2	Same as Q1				
Q3	Same as Q1				
Q4	Same as Q1				
R1	RESISTOR, Fixed Composition, 22K $\pm$ 5%, 1/4W	906900223			1
R2	RESISTOR, Fixed Composition, 15K $\pm$ 5%, 1/4W	906900153			1
R3	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			2
R4	RESISTOR, Fixed Composition, 27K $\pm$ 5%, 1/4W	906900273			4
R5	Same as R4				
R6	RESISTOR, Fixed Composition, 8200 $\pm$ 5%, 1/4W	906900822			1
R7	RESISTOR, Fixed Composition, 47 $\pm$ 5%, 1/4W	906900470			1
R8	RESISTOR, Fixed Composition, 12K $\pm$ 5%, 1/4W	906900123			1
R9	RESISTOR, Fixed Composition, 560 $\pm$ 5%, 1/4W	906900561			2
R10	Same as R9				
R11	RESISTOR, Fixed Composition, 390 $\pm$ 5%, 1/4W	906900391			1
R12	Same as R4				
R13	RESISTOR, Fixed Composition, 2200 $\pm$ 5%, 1/4W	906900222			2
R14	RESISTOR, Fixed Composition, 270 $\pm$ 5%, 1/4W	906900271			1
R15	RESISTOR, Fixed Composition, 3000 $\pm$ 5%, 1/4W	906900302			2
R16	RESISTOR, Fixed Composition, 470 $\pm$ 5%, 1/4W	906900471			1
R17	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			1
R18	RESISTOR, Fixed Composition, 220 $\pm$ 5%, 1/4W	906900221			3
R19	Same as R4				
R20	Same as R13				
R21	Same as R18				
R22	Same as R15				
R23	RESISTOR, Fixed Composition, 120 $\pm$ 5%, 1/4W	906900121			1
R24	RESISTOR, Variable 25 Turn 500 Ω Type RP	907900219	AB	RP501U	1
R25	RESISTOR, Fixed Composition, 1K $\pm$ 5%, 1/4W	906900102			2
R26	Same as R25				
R27	Same as R10				
R28	Same as R18				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>N.B. AND W.B. FOLLOWERS</u>				
A07	ASSEMBLY, N.B. and W.B. Followers	C02418700	Sierra	C02418700	1
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	8
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
K1	RELAY, Reed SPDT, PC Mtg.	912600053	Winelco	PC-1C-12M	2
K2	Same as K1				
Q1	TRANSISTOR, PNP Silicon, 2N3640	910300047	Fairchild	2N3640	3
Q2	Same as Q1				
Q3	Same as Q1				
R1	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			1
R2	RESISTOR, Fixed Composition, 3900 $\pm$ 5%, 1/4W	906900392			1
R3	RESISTOR, Fixed Composition, 8200 $\pm$ 5%, 1/4W	906900822			2
R4	RESISTOR, Fixed Composition, 39K $\pm$ 5%, 1/4W	906900393			3
R5	RESISTOR, Fixed Composition, 33K $\pm$ 5%, 1/4W	906900333			3
R6	RESISTOR, Fixed Composition, 12K $\pm$ 5%, 1/4W	906900123			2
R7	RESISTOR, Fixed Composition, 560 $\pm$ 5%, 1/4W	906900561			1
R8	RESISTOR, Fixed Composition, 820 $\pm$ 5%, 1/4W	906900821			1
R9	RESISTOR, Fixed Composition, 3300 $\pm$ 5%, 1/4W	906900332			2
R10	Same as R3				
R11	Same as R4				
R12	Same as R5				
R13	Same as R6				
R14	RESISTOR, Fixed Composition, 180 $\pm$ 5%, 1/4W	906900181			1
R15	Same as R4				
R16	Same as R5				
R17	Same as R9				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>METER AMPLIFIER</u>				
A08	ASSEMBLY, Meter Amplifier	C02418800	Sierra	C02418800	1
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	12
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, Tubular Ceramic, 120 pF, NPO	901400121	Centralab	TCZ 120	2
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	Same as C4				
C10	Same as C1				
C11	Same as C1				
C12	Same as C1				
C13	Same as C1				
C14	CAPACITOR, Dura Mica, 120 pF $\pm$ 5%	901900121	El Menco	DM15-121J	1
C15	Same as C1				
CR1	DIODE, Hot Carrier, HP 2900	910500070	HPA	HP 2900	1
K1	RELAY, Reed SPDT, P.C. Mtg.	912600053	Winelco	PC-1C-12M	1
L1	INDUCTOR, Variable, 39 μ H, $\pm$ 20%	909400064	Delevan	4450-31	3
L2	Same as L1				
L3	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	2
L4	Same as L1				
L5	Same as L3				
Q1	TRANSISTOR, NPN Silicon, 2N3563	910300042	Fairchild	2N3563	1
Q2	TRANSISTOR, PNP Silicon, 2N3640	910300047	Fairchild	2N3640	2
Q3	Same as Q2				
R1	RESISTOR, Fixed Composition, 330 $\pm$ 5%, 1/4W	906900331	AB	RP 151M	3
R2	RESISTOR, Variable, 150 Type RP, 25 Turn	907900171			1
R3	RESISTOR, Fixed Composition, 10K $\pm$ 5%, 1/4W	906900103			2
R4	RESISTOR, Fixed Composition, 27K $\pm$ 5%, 1/4W	906900273			1
R5	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			4

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>METER AMPLIFIER (Continued)</u>				
R6	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123			2
R7	RESISTOR, Fixed Composition, 220 $\pm 5\%$, 1/4W	906900221			1
R8	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472			3
R9	RESISTOR, Fixed Composition, 47K $\pm 5\%$, 1/4W	906900473			1
R10	Same as R8				
R11	Same as R4				
R12	RESISTOR, Fixed Composition, 1K $\pm 5\%$, 1/4W	906900102			1
R13	RESISTOR, Fixed Composition, 68K $\pm 5\%$, 1/4W	906900683			1
R14	Same as R5				
R15	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333			2
R16	RESISTOR, Fixed Composition, 56K $\pm 5\%$, 1/4W	906900563			2
R17	Same as R5				
R18	Same as R8				
R19	Same as R1				
R20	RESISTOR, Fixed Composition, 6.8K $\pm 5\%$, 1/4W	906900682			2
R21	Same as R15				
R22	Same as R16				
R23	Same as R5				
R24	RESISTOR, Variable, 15 Turns, 1K E-Z Trim	907900209	Bourns	3067P-1-102	1
R25	Same as R7				
R26	Same as R1				
R27	Same as R20				
R28	RESISTOR, Fixed Composition, 390 $\pm 5\%$, 1/4W	906900391			1
	<u>METER CIRCUIT</u>				
A09	ASSEMBLY, Meter Circuit	C02418900	Sierra	C02418900	1
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	8
C2	Same as C1				
C3	Same as C1				
C4	CAPACITOR, Dura Mica, 18 pF $\pm 5\%$, 500V	901900180	El Menco	DM15-180J	1
C5	Same as C1				
C6	CAPACITOR, Vert. Mtg. Plastic Encased Non-Polarized, 10 μ F, 25V	903300106	Nashville Elect.	12-375BP10- 25S85NP	1
C7	Same as C1				
C8	Same as C1				
C9	Same as C1				
C10	Same as C1				
C11	CAPACITOR, Tubular, 50 μ F, 25 VDC		Sprague	TL-1209#31D92	1
CR1	DIODE, MA4121	910500073	Microwave Ass.	MA4121	2
CR2	Same as CR1				
CR3	DIODE, HP2900	910500070	Hughes	HP2900	2
CR4	Same as CR3				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>METER CIRCUIT (Continued)</u>				
L1	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	1
Q1	TRANSISTOR, NPN, Silicon, 2N3563	910300042	Fairchild	2N3563	1
Q2	TRANSISTOR, PNP, Silicon, 2N3640	910300047	Fairchild	2N3640	1
R1	RESISTOR, Fixed Composition, 39K $\pm 5\%$, 1/4W	906900393	Speer		2
R2	Same as R1				
R3	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560	Speer		1
R4	RESISTOR, Fixed Composition, 6800 $\pm 5\%$, 1/4W	906900682	Speer		1
R5	RESISTOR, Fixed Composition, 150 $\pm 5\%$, 1/4W	906900151	Speer		1
R6	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392	Speer		2
R7	RESISTOR, Fixed Composition, 8200 $\pm 5\%$, 1/4W	906900822	Speer		1
R8	RESISTOR, Fixed Composition, 180 $\pm 5\%$, 1/4W	906900181	Speer		1
R9	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W	906900272	Speer		1
R10	RESISTOR, Fixed Composition, 100 $\pm 5\%$, 1/4W	906900101	Speer		1
R11	RESISTOR, Fixed Composition, 1000 $\pm 5\%$, 1/4W	906900102	Speer		1
R12	RESISTOR, Fixed Composition, 4700 $\pm 5\%$, 1/4W	906900472	Speer		1
R13	RESISTOR, Fixed Composition, 82K $\pm 5\%$, 1/4W	906900823	Speer		2
R14	RESISTOR, Variable, 25 Turn, 50K, Type RP	907900184	AB	RP 503M	1
R15	Same as R13				
R16	RESISTOR, Variable, 5K Type RP 25T	907900186	AB	RP 502M	1
R17	Same as R6				
R18	RESISTOR, Fixed Composition, 3300 $\pm 5\%$, 1/4W	906900332			1
	<u>SIDEBAND OSCILLATOR</u>				
A10	ASSEMBLY, Sideband Oscillator	C02419000	Sierra	C02419000	1
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	10
C2	Same as C1				
C3	CAPACITOR, Dura Mica, 68 pF, $\pm 5\%$, 500V	901910680	El Menco	DM15-680J	2
C4	CAPACITOR, Dura Mica, 390 pF, $\pm 5\%$, 500V	901900391	El Menco	DM15-391J	2
C5	Same as C1				
C6	Same as C1				
C7	Same as C1				
C8	Same as C1				
C9	Same as C1				
C10	Same as C3				
C11	Same as C4				
C12	Same as C1				
C13	Same as C1				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>SIDEBAND OSCILLATOR (Continued)</u>				
C14	Same as C1				
L1	INDUCTOR, Variable, 82 μ H $\pm$ 20%	909400063	Delevan	4450-35	2
L2	INDUCTOR, Fixed, 24 μ H, Molded	909000121	Delevan	1537-46	2
L3	Same as L1				
L4	Same as L2				
Q1	TRANSISTOR, PNP, 2N1728	910300008		2N1728	2
Q2	TRANSISTOR, PNP, 2N1745	910300020	Philco	2N1745	2
Q3	Same as Q1				
Q4	Same as Q2				
R1	RESISTOR, Fixed Composition, 8200 $\pm$ 5%, 1/4W	906900822			2
R2	RESISTOR, Fixed Composition, 10K $\pm$ 5%, 1/4W	906900103			2
R3	RESISTOR, Fixed Composition, 2700 $\pm$ 5%, 1/4W	906900272			2
R4	RESISTOR, Fixed Composition, 4700 $\pm$ 5%, 1/4W	906900472			2
R5	RESISTOR, Fixed Composition, 1500 $\pm$ 5%, 1/4W	906900152			2
R6	RESISTOR, Fixed Composition, 270 $\pm$ 5%, 1/4W	906900271			2
R7	RESISTOR, Fixed Composition, 12K $\pm$ 5%, 1/4W	906900123			2
R8	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			2
R9	RESISTOR, Fixed Composition, 2200 $\pm$ 5%, 1/4W	906900222			4
R10	Same as R9				
R11	Same as R1				
R12	Same as R2				
R13	Same as R3				
R14	Same as R4				
R15	Same as R5				
R16	Same as R6				
R17	Same as R7				
R18	Same as R8				
R19	Same as R9				
R20	Same as R9				
Y1	CRYSTAL, 2216.500 kHz	912200029	Wright	A01896800	1
Y2	CRYSTAL, 2213.500 kHz	912200028	Wright	A01896900	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>AUDIO</u>				
A11	ASSEMBLY, Audio	C02419100	Sierra	C02419100	1
C1	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	4
C2	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	5
C3	Same as C2				
C4	CAPACITOR, Dura Mica, 62 pF, $\pm 2\%$, 500V	901900620	El Menco	DM15-620G	1
C5	CAPACITOR, Vert. Mtg. Plastic Encased, 10 μ F, 25V, Non-Polarized	903300106	Nashville Elect.	12-375BP 10- 25S85NP	4
C6	Same as C1				
C7	CAPACITOR, Dura Mica, 680 pF, $\pm 5\%$, 500V	901900681	El Menco	DM15-681J	1
C8	CAPACITOR, Tubular, 50 μ F, 25VDC	902230506	Sprague	TL-1209-31D92	3
C9	Same as C1				
C10	Same as C1				
C11	Same as C2				
C12	Same as C8				
C13	Same as C5				
C14	Same as C8				
C15	Same as C2				
C16	Same as C2				
C17	Same as C5				
C18	CAPACITOR, Tubular, 25 μ F, 25VDC	902230256	Sprague	TL-1207-31D90	1
C19	Same as C5				
CR1	DIODE, Silicon, 1N456	910500031	RCA	1N456	1
L1	INDUCTOR, Variable, 82 μ H, $\pm 20\%$	909400063	Delevan	4450-35	1
L2	INDUCTOR, Fixed, 3.3 mH	909000116	J.W. Miller	70F333A1	1
Q1	TRANSISTOR, PNP, Silicon, 2N3640	910300047	Fairchild	2N3640	1
Q2	TRANSISTOR, PNP, 2N1745	910300020	Philco	2N1745	1
Q3	TRANSISTOR, PNP, 2N1728	910300008	Philco	2N1728	1
Q4	TRANSISTOR, PNP, Silicon, 2N3638	910300037	Fairchild	2N3638	2
Q5	Same as Q4				
R1	RESISTOR, Fixed Composition, 33K $\pm 5\%$, 1/4W	906900333	AB		1
R2	RESISTOR, Fixed Composition, 56K $\pm 5\%$, 1/4W	906900563	AB		1
R3	RESISTOR, Fixed Composition, 100K $\pm 5\%$, 1/4W	906900104	AB		1
R4	RESISTOR, Variable, 1000 Ω	907900127	Beckman Inst.	62 PAR-1K	1
R5	RESISTOR, Fixed Composition, 6800 Ω $\pm 5\%$, 1/4W	906900682	AB		1
R6	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	906900123	AB		1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>AUDIO (Continued)</u>				
R7	RESISTOR, Fixed Composition, 1000 Ω $\pm$ 5%, 1/4W	906900102	AB		2
R8	RESISTOR, Fixed Composition, 120K $\pm$ 5%, 1/4W	906900124	AB		1
R9	RESISTOR, Fixed Composition, 22K $\pm$ 5%, 1/4W	906900223	AB		2
R10	RESISTOR, Fixed Composition, 2200 Ω $\pm$ 5%, 1/4W	906900222	AB		1
R11	RESISTOR, Fixed Composition, 4700 Ω $\pm$ 5%, 1/4W	906900472	AB		1
R12	Same as R9				
R13	RESISTOR, Fixed Composition, 5600 Ω $\pm$ 5%, 1/4W	906900562	AB		1
R14	RESISTOR, Fixed Composition, 10K $\pm$ 5%, 1/4W	906900103	AB		2
R15	RESISTOR, Fixed Composition, 560 Ω $\pm$ 5%, 1/4W	906900561	AB		2
R16	RESISTOR, Fixed Composition, 39K $\pm$ 5%, 1/4W	906900393	AB		1
R17	Same as R14				
R18	Same as R15				
R19	Same as R7				
	<u>POWER SUPPLY</u>				
A12	ASSEMBLY, Power Supply	C02419200	Sierra	C02419200	1
C1	CAPACITOR, Tubular, 1000 μ F, 35V	902250108	Syncro	EMW01946A	1
C2	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	1
C3	CAPACITOR, Tubular, 100 μ F, 30V	902260107	Syncro	EMW-01930	1
CR1	SILICON, Rectifier Bridge, 200V PRV. 1.8A	910800023	International Rectifier	10 DB2A	1
CR2	DIODE, Silicon	910500031	RCA	1N456	4
CR3	Same as CR2				
CR4	Same as CR2				
CR5	Same as CR2				
CR6	DIODE, Zener, 6.2V, 400 mW	910500001		1N753	1
Q1	TRANSISTOR, PNP, Silicon	910300037	Fairchild	2N3638	1
Q2	TRANSISTOR, NPN, Power	910300069	RCA	40251	1
Q3	TRANSISTOR, NPN, Power	910300068	RCA	40250	1
Q4	TRANSISTOR, NPN, Silicon	910300044	Fairchild	2N3641	1
Q5	TRANSISTOR, NPN, Silicon	910300046	Fairchild	2N3565	2
Q6	Same as Q5				
R1	RESISTOR, Fixed Composition, 3300 $\pm$ 5%, 1/4W	906900332			2
R2	RESISTOR, Fixed Composition, 3900 $\pm$ 5%, 1/4W	905000392			1
R3	RESISTOR, Fixed, 2 Ω , $\pm$ 5%, 3-1/4W	906200020	Ohmite	Series #99 #4337	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>POWER SUPPLY (Continued)</u>				
R4	RESISTOR, Fixed Composition, 1200 $\pm 5\%$, 1/4W	906900122	Beckman Instr.	Series #99#4337	1
R5	RESISTOR, Fixed Composition, 2200 $\pm 5\%$, 1/4W	906900222			2
R6	RESISTOR, Fixed Composition, 3900 $\pm 5\%$, 1/4W	906900392		62 PAR 2K	1
R7	RESISTOR, Variable, 2000 Ω Helitrim Type 62PA	907900228			1
R8	RESISTOR, Fixed Composition, 2700 $\pm 5\%$, 1/4W	906900272			2
R9	Same as R8				
R10	Same as R5				
R11	Same as R1				
R12	RESISTOR, Fixed Composition, 300 Ω $\pm 5\%$, 1/4W	906200301	Ohmite	Series #99 Series #4404	1
	<u>IMPEDANCE MATCHING PAD</u>				
A13	ASSEMBLY, Impedance Matching Pad	C02417900	Sierra	C02417900	1
C1	CAPACITOR, Dura Mica, 27 pF $\pm 2\%$, 500V	901910270	El Menco	DM15-270G	1
J18	Part of BNC Insertion Unit (Ref.)				
J19	Part of BNC Insertion Unit (Ref.)				
L1	INDUCTOR, Fixed RF 0.22 μ H, Uninsulated	909400068	Jeffers	10100-23	1
R1	RESISTOR, Metal Film, 43.2 $\pm 1\%$, 1/2W	908300065	IRC	Type CEC	1
R2	RESISTOR, Metal Film, 86.6 $\pm 1\%$, 1/2W	908300066	IRC	Type CEC	1
Ref.	BNC INSERTION UNIT, 2 Jacks	914600111	Bishop Instr.	090-011	1
	<u>LOW-PASS FILTER</u>				
A14	ASSEMBLY, Low-Pass Filter	C02416002	Sierra	C02416002	1
C1	CAPACITOR, Dura Mica, 68 pF $\pm 2\%$, 500V	901900680	El Menco	DM15-680G	1
C2	CAPACITOR, Variable, Glass PC Mtg., 0.8-12 pF	903020120	Erie	565-013	5
C3	CAPACITOR, Dura Mica, 82 pF $\pm 2\%$, 500V	901900820	El Menco	DM15-820G	3

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
<u>LOW-PASS FILTER (Continued)</u>					
C4	CAPACITOR, Dura Mica, 43 pF $\pm 2\%$, 500V	901900430	El Menco	DM15-430G	3
C5	Same as C4				
C6	Same as C2				
C7	CAPACITOR, Dura Mica, 91 pF $\pm 2\%$, 500V	901900910	El Menco	DM15-910G	1
C8	Same as C3				
C9	Same as C2				
C10	Same as C3				
C11	CAPACITOR, Dura Mica, 30 pF $\pm 2\%$, 500V	901900300	El Menco	DM15-300G	1
C12	Same as C4				
C13	Same as C2				
C14	CAPACITOR, Dura Mica, 100 pF $\pm 2\%$, 500V	901910101	El Menco	DM15-101G	1
C15	CAPACITOR, Dura Mica, 27 pF $\pm 2\%$, 500V	901910270	El Menco	DM15-270G	1
C16	Same as C2				
C17	CAPACITOR, Dura Mica, 50 pF $\pm 2\%$, 500V	901900500	El Menco	DM15-500G	1
L1	INDUCTOR, Fixed, 0.30 μ H $\pm 2\%$	909300007	Sierra	A02395600	1
L2	INDUCTOR, Fixed, 0.235 μ H $\pm 2\%$	909300006	Sierra	A02385700	1
L3	INDUCTOR, Fixed, 0.176 μ H $\pm 2\%$	909300005	Sierra	A02385800	1
L4	INDUCTOR, Fixed, 0.186 μ H $\pm 2\%$	909300004	Sierra	A02385900	1
L5	INDUCTOR, Fixed, 0.23 μ H $\pm 2\%$	909300003	Sierra	A02386000	1
R1	RESISTOR, Fixed Composition, 12K $\pm 5\%$, 1/4W	907900123			1
R2	RESISTOR, Fixed Composition, 56 $\pm 5\%$, 1/4W	906900560			1
<u>METER COMPENSATION</u>					
A15	ASSEMBLY, Meter Compensation	B02419500	Sierra	B02419500	1
C1	CAPACITOR, Tantalum, 100 μ F	902700107	Sprague	150D107X0010R2	1
R1	THERMISTOR, 300 ohm, Disc with Axial Lead	913600014	Veco	23D20	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>CHASSIS</u>				
AT1	ATTENUATOR, 75 Ω , 0-9 dB	912100011	Texscan Corp.	A02413900	1
AT2	ATTENUATOR, 75 Ω , 0-90 dB	912100012	Texscan Corp.	A02413800	1
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150V	901440103	Centralab	DDM-103	2
C2	CAPACITOR, Disc Ceramic, 0.1 μ F, 50V	901410104	Sprague	33C41	5
C3	Same as C2				
C4	Same as C2				
C5	Same as C2				
C6	Same as C2				
C7	Same as C2				
DS1	DISPLAY, Readout Attenuator Logic, A02469001	919900024	IEE Series 350	355-2167-A-C1	1
F1	FUSE, 0.5A, 3AG SLO-BLO	913200011	Littelfuse		2
F2	Same as F1				
FL1	FILTER, Crystal, 250 Hz	910100004	Blackhawk	A01448600	1
FL2	FILTER, Crystal, 3100 Hz	910100017	Blackhawk	A02088500	1
J1A	CONNECTOR, Printed Circuit, 6 Contacts	914800094	Viking Ind. Inc.	A02360003	18
J1B	Same as J1A				
J2A	Same as J1A				
J2B	Same as J1A				
J3A	Same as J1A				
J3B	Same as J1A				
J4A	Same as J1A				
J4B	Same as J1A				
J5A	Same as J1A				
J5B	Same as J1A				
J6A	Same as J1A				
J6B	Same as J1A				
J7A	Same as J1A				
J7B	Same as J1A				
J8A	Same as J1A				
J8B	Same as J1A				
J9A	Same as J1A				
J9B	Same as J1A				
J10	CONNECTOR, Printed Circuit, 15 Contact	914800074	Viking Ind. Inc.	A02360001	3
J11	Same as J10				
J12	Same as J10				
J13	RECEPTACLE, Coaxial, 75 Ω W/BNC On Back	914600108	Trimm	89-32	2
J13A	Same as J13				
J14	Part of AT1				
J15	Part of AT1				
J16	Part of AT2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>CHASSIS (Continued)</u>				
J17	Part of AT2				
J18	Part of A13				
J19	Part of A13				
J20	Part of A14				
J21	Part of A14				
J22	Part of A14				
J23A	JACK, Phone	914400018	Switchcraft	MT-331	2
J23B	Same as J23A				
J24	CONNECTOR, BNC Panel Jack	914600074	Gremar	UG-657/U	3
J25	Same as J24				
J26	CONNECTOR, BNC Bulkhead Jack	914600112	King Electronics	KC-19-68	1
J27	Same as J24				
J28	JACK, Phone	914400016	Switchcraft	12A	1
L1	INDUCTOR, Fixed, 68 μ H	909000131	Nytronics	WEE-68	1
L2	INDUCTOR, Fixed, 24 μ H	909000121	Delevan	1537-46	2
M1	METER, Projection	911800109	Weston		1
P1	LINE CORD, B02466900	916400025		B02466900	1
P2	Not Used				
P3	Not Used				
P4	Not Used				
P5	Not Used				
P6	Not Used				
P7	Not Used				
P8	Not Used				
P9	Not Used				
P10	Not Used				
P11	Not Used				
P13	CONNECTOR, BNC, Plug	914600117	King Electronic	KC-59-79	3
P14	Same as P13				
P15	CONNECTOR, BNC, Angle Plug	914600114	King Electronic	KC-59-102	3
P16	Same as P15				
P17	Same as P13				
P18	Same as P15				
P19	CONNECTOR, BNC, Plug	914600122	King Electronic	KC-59-95	1
P20	CONNECTOR, Sub-Min., Plug	914600010	AMP	329036-1	3
P21	Same as P20				
P22	Same as P20				
R1	RESISTOR, Variable, 200 Ω 0.2W Linear	907900266	Clarostat	Series 48M	1
R2	RESISTOR, Fixed Composition, 100 $\pm$ 5%, 1/4W	906900101			1
R3	RESISTOR, Variable, 50K 2W Linear	907900265	CTS	HT321	1
R4	RESISTOR, Variable, 10K, 2W	907900037		SS-393337	1
R5	RESISTOR, Fixed Composition, 220 Ω , $\pm$ 5%, 1/4W	906900221			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>CHASSIS (Continued)</u>				
S1	SWITCH, Rotary, A02417500	911200142	Oak	A02417500	1
S2	SWITCH, Rotary, A02417600	911200143	Oak	A02417600	1
S3	SWITCH, Rotary, 2 Sec. 6 Pole, 3 Position	911200144	Oak	Moduline Type F	1
S4	SWITCH, Rotary, 2 Pole, 3 Position	911200058	Oak	SS-14206-1	1
S5	SWITCH, Lighted Push-Button (White and Green)	911300013	Microswitch	302PB6-T-W G	1
S6	SWITCH, Rotary, 2 Pole, 2 Position	911200011	Oak	SS-3683-2	1
S7	SWITCH, Slide DPDT	911000040	Switchcraft	46256LF	1
T1	TRANSFORMER, Power, A02387100	910000100	Spatron Inc.	A02387100	1
XF1 XF2	FUSE HOLDER Same as XF1	913400014	Littelfuse	34004	2
	(Connectors For Accessory Cables) CONNECTOR, BNC Plug	914600113	King Electronic	KC-59-98	6

SECTION V

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC OPERATION
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
A2	<u>ASSEMBLY, FIRST MIXER</u>	C02423200	Sierra	C02423200	1
C1	CAPACITOR, Disc Ceramic, .01 μ F, 150WVDC	901440103	Centralab	DDM103	6
C2	Same as C1				
C3	CAPACITOR, Durmica, 68 pF $\pm$ 5%, 500WVDC	901900680	El Menco	DM15-680J	2
C4	CAPACITOR, Disc Ceramic, 1.8 pF $\pm$.25 pF NPO	901400018	Sprague	10TCC-V18	2
C5	Same as C3				
C6	Same as C4				
C7	Same as C3				
C8	CAPACITOR, Disc Ceramic, 1000 pF, 150WVDC	901400102	Erie	25U	
C9	Same as C1				
C10	Same as C1				
C11	Same as C1				
C12	Same as C1				
C13	Same as C8				
C14	CAPACITOR, Durmica, 5 pF $\pm$ 5%, 500WVDC	901900050	El Menco	DM15-050K	1
C15	CAPACITOR, Durmica, 130 pF $\pm$ 2%, 500WVDC	901900131	El Menco	DM15F-131G	1
C16	Same as C8				
C17	Same as C8				
C18	CAPACITOR, Durmica, 33 pF $\pm$ 5%, 500WVDC	901900330	El Menco	DM15-330J	1
C17	CAPACITOR, Tubular, Ceramic, 0.5 pF $\pm$.25 pF, 500WVDC	901400005	Aerovox	CC21CKOR5C	
C20	Same as C18				
C21	CAPACITOR, Durmica, 270 pF $\pm$ 5%, 500WVDC	901900271	El Menco	DM19-271J	1
C22	Same as C8				
L1	COIL, Adjustable, 0.9 μ H Nom.	A02424700	Sierra	A02424700	3
L2	Same as L1				
L3	Same as L1				
L4	INDUCTOR, RF, 24 μ H $\pm$ 10%	909000121	J.W.Miller	9320-36	2
L5	Same as L4				
L6	COIL, Adjustable, 0.45 μ H Nom.	A02424800	Sierra	A02424800	2
L7	Same as L6				
Q1	TRANSISTOR, Silicon, Type 2N3646	910300036	Fairchild	2N3646	2
Q2	TRANSISTOR, Silicon, Type PT3500	910300067	TRW	PT3500	1
Q3	Same as Q1				
R1	RESISTOR, Fixed Composition, 56 Ω $\pm$ 5%, 1/4W	906900560	Speer		3
R2	RESISTOR, Fixed Composition, 6.8K $\pm$ 5%, 1/4W	906900682	Speer		4
R3	Same as R2				
R4	POTENTIOMETER, Cermet, Trimmer, 200 Ω	907900262	CTS	171PCS201A	2
R5	RESISTOR, Fixed Composition, 1.2K $\pm$ 5%, 1/4W	906900122	Speer		1
R	RESISTOR, Fixed Composition, 3.9K $\pm$ 5%, 1/4W	906900392	Speer		1
R7	RESISTOR, Fixed Composition, 5.6K $\pm$ 5%, 1/4W	906900562	Speer		1
R8	RESISTOR, Fixed Composition, 100 Ω $\pm$ 5%, 1/4W	906900101	Speer		1
R9	RESISTOR, Fixed Composition, 270 Ω $\pm$ 5%, 1/4W	905000271	AB	EB	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, FIRST MIXER (Continued)</u>				
R10	RESISTOR, Fixed Composition, $47\Omega \pm 5\%$, 1/4W	906900470	Speer	EB	2
R11	Same as R4				
R12	RESISTOR, Fixed Composition, $150\Omega \pm 5\%$, 1/4W	906900151	Speer		1
R13	Same as R1				
R14	Same as R1				
R15	Same as R2				
R16	Same as R2				
R17	Same as R10				
R18	RESISTOR, Fixed Composition, $1.8K \pm 5\%$, 1/4W	906900182	Speer		1
T1	TRANSFORMER, RF	A02424600	Sierra	A02424600	1
Z1	MODULATOR, Balanced Diode	919900028	Relcom	M6	
A3	<u>ASSEMBLY, SECOND MIXER MODULE</u>	C02423000	Sierra	C02423000	1
C1	CAPACITOR, Disc Ceramic, 1000 pF	901400102	Erie	Z5U	7
C2	CAPACITOR, Tantalum, $10 \mu F \pm 10\%$, 15WVDC	902740106	T.I.	SCM4 or IEI	1
C3	Same as C1				
C4	Same as C1				
C5	CAPACITOR, Ceramic, $500 \mu F \pm 20\%$, 1000WVDC	901410501	Centralab	DD-501	7
C6	Same as C5				
C7	Same as C5				
C8	CAPACITOR, Durmica, 5 pF, 500WVDC	901900050	El Menco	DM15-050J	1
C9	Same as C5				
C10	CAPACITOR, Disc Ceramic, $.01 \mu F$, 150V	901440103	Centralab	DDM-103	1
C11	Same as C5				
C12	CAPACITOR, Durmica, $120 \mu F \pm 5\%$, 500WVDC	901900121	El Menco	DM15-121J	1
C13	Same as C5				
C14	Same as C5				
C15	Same as C1				
C16	Same as C1				
C17	Same as C1				
C18	Same as C1				
C19	CAPACITOR, Durmica, $39 \mu F \pm 5\%$, 500WVDC	901900390	El Menco	DM15-390J	1
C20	CAPACITOR, Durmica, $330 \mu F \pm 5\%$, 500WVDC	901900331	El Menco	DM15-331J	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, SECOND MIXER MODULE (Continued)</u>				
CR1	DIODE, Zener, 7.1V $\pm 5\%$, 400 mW	910500032	Int. Rect. HPA	1N707A 2900	1
CR2	DIODE, Hot Carrier	910500070			2
CR3	Same as CR2				
J1-4	Not Used				
J5	CONNECTOR, Coaxial, Female, Submin., PC Mtg.	914600100	AMP		1
L1	INDUCTOR, RF Choke, 3.3 μ H $\pm 5\%$	909200043	Jeffers	4425-12	4
L2	Same as L1				
L3	Same as L1				
L4	Same as L1				
L5	INDUCTOR, Adjustable, 0.45 μ H	A02424800	Sierra	A02424800	1
Q1	TRANSISTOR, Silicon, NPN, Type 2N3563	910300042	Fairchild	2N3563	4
Q2	Same as Q1				
Q3	Same as Q1				
Q4	TRANSISTOR, Field Effect, N Channel, Type 2N3819	910300069	T.I.	2N3819	1
Q5	TRANSISTOR, Silicon, NPN, Type 2N3137	910300025	Fairchild	2N3137	1
Q6	Same as Q1				
R1	RESISTOR, Composition, 68 Ω $\pm 5\%$, 1/2W	905000680	AB	EB	1
R2	RESISTOR, Composition, 3.9K Ω $\pm 5\%$, 1/4W	906900392	Speer		2
R3	RESISTOR, Composition, 470K Ω $\pm 5\%$, 1/4W	906900474	Speer		1
R4	RESISTOR, Composition, 56 Ω $\pm 5\%$, 1/4W	906900560	Speer		3
R5	RESISTOR, Composition, 470 Ω $\pm 5\%$, 1/4W	906900471	Speer		2
R6	RESISTOR, Composition, 1.2K $\pm 5\%$, 1/4W	906900122	Speer		2
R7	RESISTOR, Composition, 1.8K $\pm 5\%$, 1/4W	906900182	Speer		1
R8	RESISTOR, Composition, 1.0K $\pm 5\%$, 1/4W	906900102	Speer		1
R9	Same as R5				
R10	RESISTOR, Composition, 180 Ω $\pm 5\%$, 1/4W	906900181	Speer		1
R11	RESISTOR, Composition, 1.5K Ω $\pm 5\%$, 1/4W	906900152	Speer		1
R12	RESISTOR, Composition, 22K $\pm 5\%$, 1/4W	906900223	Speer		2
R13	RESISTOR, Composition, 27 Ω $\pm 5\%$, 1/4W	906900270	Speer		1
R14	RESISTOR, Composition, 220 Ω $\pm 5\%$, 1/2W	905000221	AB	EB	1
R15	RESISTOR, Composition, 560 Ω $\pm 5\%$, 1/4W	906900561	Speer		1
R16	RESISTOR, Composition, 47K $\pm 5\%$, 1/4W	906900473	Speer		1
R17	Same as R2				
R18	RESISTOR, Composition, 4.7K $\pm 5\%$, 1/4W	906900472	Speer		1
R19	RESISTOR, Composition, 2.7K $\pm 5\%$, 1/4W	906900272	Speer		1
R20	POTENTIOMETER, Trimmer, 10K 20%, PC Mtg.	907900281	Helipot	79PR10K	1
R21	RESISTOR, Composition, 6.8K $\pm 5\%$, 1/4W	906900682			1
R22	RESISTOR, Composition, 47 Ω $\pm 5\%$, 1/4W	906900470	Speer		1
R23	Same as R4				
R24	RESISTOR, Composition, 5.6K $\pm 5\%$, 1/4W	906900562	Speer		1
R25	RESISTOR, Composition, 10K $\pm 5\%$, 1/4W	906900103	Speer		1
R26	Same as R6				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, SECOND MIXER MODULES (Continued)</u>				
R27	POTENTIOMETER, Trimmer, 200 Ω , 25T Cermet	907900282	Helipot	63PR200	1
R28	RESISTOR, Composition, 10 Ω $\pm$ 5%, 1/4W	906900100	Speer		4
R29	Same as R28				
R30	RESISTOR, Composition, 120 Ω $\pm$ 5%, 1/4W	906900121	Speer		2
R31	Same as R28				
R32	Same as R30				
R33	Same as R28				
R34	Same as R4				
Z1	OPERATION AMPLIFIER	919900027	Melcor	M1573	1
Z2	MODULATOR, Balanced	919900028	Relcom	M6	1
A4	<u>ASSEMBLY, 32 MHz LOW-PASS FILTER</u>	C02418001	Sierra	C02418001	1
C1	CAPACITOR, Durmica 68 pF $\pm$ 2%, 500WVDC	901900680	El Menco	DM15-680G	1
C2	CAPACITOR, Glass Piston Trimmer .7-12 pF, PC Mtg.	903000120	Erie	565-013	5
C3	CAPACITOR, Durmica, 82 pF $\pm$ 2%, 500WVDC	901900820	El Menco	DM15-820G	3
C4	CAPACITOR, Durmica, 43 pF $\pm$ 2%, 500WVDC	901900430	El Menco	DM15-430G	3
C5	Same as C2				
C6	Same as C4				
C7	CAPACITOR, Durmica, 91 pF $\pm$ 2%, 500WVDC	901900910	El Menco	DM15F910G	1
C8	Same as C3				
C9	Same as C2				
C10	Same as C3				
C11	CAPACITOR, Durmica, 30 pF $\pm$ 2%, 500WVDC	901900300	El Menco	DM15-300G	1
C12	Same as C4				
C13	Same as C2				
C14	CAPACITOR, Durmica, 100 pF $\pm$ 2%, 500WVDC	901910101	El Menco	DM15-101G	1
C15	CAPACITOR, Durmica, 27 pF $\pm$ 2%, 500WVDC	901910270	El Menco	DM15-270G	1
C16	Same as C2				
C17	CAPACITOR, Durmica, 50 pF $\pm$ 2%, 500WVDC	901900500	El Menco	DM15-500G	1
L1	INDUCTOR, Toroid, .30 μ H	909300007	Sierra	A02385600	1
L2	INDUCTOR, Toroid, .235 μ H	909300006	Sierra	A02385700	1
L3	INDUCTOR, Toroid, .176 μ H	909300005	Sierra	A02385800	1
L4	INDUCTOR, Toroid, .186 μ H	909300004	Sierra	A02385900	1
L5	INDUCTOR, Toroid, .23 μ H	909300003	Sierra	A02386000	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
A5	ASSEMBLY, PREAMP POWER AND THERM. BRIDGE	C02423500	Sierra	C02423500	1
C1	CAPACITOR, Tantalum, 22 μ F, 15WVDC	902740226	Sprague	150D226X9015S	7
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	CAPACITOR, Tantalum, 47 μ F, 35WVDC	902710476	Sprague	150D476X9035S2	3
C6	Same as C1				
C7	Same as C5				
C8	CAPACITOR, Disc Ceramic, 1.5 pF NPO	901440150	Sprague	10TCC-V15	1
C9	Same as C1				
C10	Same as C5				
C11	Same as C1				
K1	RELAY, DPDT	912600054	Leach	EA1A	1
Q1	TRANSISTOR, Silicon, NPN, 2N3563	910300042			1
Q2	TRANSISTOR, Silicon, NPN, 2N3643	910300044			1
Q3	TRANSISTOR, Silicon, NPN, PT3500	910300067	TRW		1
R1	RESISTOR, Composition, 47 Ω $\pm$ 5%, 1/4W	906900470	Speer		1
R2	RESISTOR, Composition, 1.2K $\pm$ 5%, 1/4W	906900122	Speer		3
R3	Same as R2				
R4	Same as R2				
R5	RESISTOR, Composition, 470 Ω $\pm$ 5%, 1/4W	906900471	Speer		1
R6	RESISTOR, Composition, 1.8K $\pm$ 5%, 1/4W	906900182	Speer		1
R7	RESISTOR, Composition, 2.2K $\pm$ 5%, 1/4W	906900222	Speer		1
R8	RESISTOR, Composition, 270 Ω $\pm$ 5%, 1/4W	906900270	Speer		1
R9	RESISTOR, Composition, 270 Ω $\pm$ 5%, 1/4W	905000271	AB	EB	1
R10	RESISTOR, Metal Film, 86.6 Ω $\pm$ 1%, 1/2W, 50 ppm	908300070			2
R11	Same as R10				
R12	RESISTOR, Precision, 196.5 Ω $\pm$.1%, 1/4W	906100128			1
R13	RESISTOR, Metal Film, 75 Ω $\pm$ 1%, 50 ppm T.C.	908300071			1
RV1	RAYSISTOR, CK1122	910300068	Sierra	A02667400	2
RV2	Same as RV1				
Z1	I.C. VIDEO AMP	920300009	Amelco	511-131	1
Z2	I.C. VIDEO AMP	920300010	Sylvania	SA-20	1
Z3	COMPONENTS OVEN, Assembly	C02472800	Sierra	C02472800	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
A5-1	<u>ASSEMBLY, OVEN FOR THERMISTOR BRIDGE</u>	B02423700	Sierra	B02423700	1
R1	RESISTOR, Metal Film, 10K $\pm 1\%$, 1/8W, 50ppm TC	908300073			2
R2	Same as R1				
RT1	THERMISTOR, Assembly, Ind. Heated Bead.	913600013	Sierra	A02486500	2
RT2	Same as RT1				
A6	<u>ASSEMBLY, AUTOMATIC LEVEL CONTROL</u>	C02422800	Sierra	C02422800	1
CR1	DIODE, Silicon, Zener, 6.2V, 1N753A	910500080		1N753A	1
CR2	DIODE, Silicon, Zener, 7.1V, 1N707	910500032		1N707	1
Q1	TRANSISTOR, Silicon, PNP, 2N3638A, Low T.C.	910300037		2N3638	1
R1	RESISTOR, Wirewound, 1.2K $\pm 1\%$, 20 ppm, T.C. 1/4W	906100132			1
R2	RESISTOR, Wirewound, 120 Ω $\pm 1\%$, 20 ppm, T.C. 1/4W	906100131			2
R3	RESISTOR, Composition, 330 Ω $\pm 5\%$, 1/2W	905000331			1
R4	RESISTOR, Composition, 180K $\pm 5\%$, 1/4W	906900184			1
R5	RESISTOR, Composition, 27K $\pm 5\%$, 1/4W	906900273			2
R6	RESISTOR, Composition, 3.9K $\pm 5\%$, 1/4W	906900392			1
R7	RESISTOR, Composition, 6.8K $\pm 5\%$, 1/4W	906900682			1
R8	RESISTOR, Metal Film, 10K $\pm 1\%$, 1/8W	908300073			3
R9	RESISTOR, Composition, 15K $\pm 5\%$, 1/4W	906900153			1
R10	RESISTOR, Metal Film, 267K $\pm 1\%$, 1/8W	908300077			1
R11	Same as R5				
R12	RESISTOR, Composition, 240K $\pm 5\%$, 1/4W	916900244			1
R13	POTENTIOMETER, Composition, 100K $\pm 20\%$	907900279	Helipot	79PR100K	1
R14	RESISTOR, Wirewound, 1.8K $\pm 1\%$, 20 ppm, T.C. 1/4W	906100133			1
R15	Same as R2				
R16	Same as R8				
R17	Same as R8				
R18	POTENTIOMETER, Composition, 500K $\pm 20\%$, 1/2W	907900280	Helipot	79PR500K	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, AUTOMATIC LEVEL CONTROL</u> (Continued)				
Z1	OPERATIONAL AMP, Zeltex 115D	919900026	Zeltex	115D	2
Z2	Same as Z1				
A7	<u>ASSEMBLY, POWER SUPPLY REGULATORS</u>	C02422600	Sierra	C02422600	1
C1	CAPACITOR, Fixed Ceramic, 0.1 μ FD, 50WVDC	901410104			2
C2	CAPACITOR, Tantalex, 47 μ FD, 35WVDC	902710476	Sprague	150D476X9035S2	1
C3	Same as C1				
C4	CAPACITOR, Tantalex, 47 μ FD, 20WVDC	902700476	Sprague	150D476X9020S2	1
CR1	DIODE, Silicon, 1N4148	910500075			8
CR2	Same as CR1				
CR3	DIODE, Zener, 1N751A, 5.1V 5%	910500076	Transitron	1N751A	1
CR4	Same as CR1				
CR5	DIODE, Zener, 1N753, 6.2V	910500001			2
CR6	Same as CR1				
CR7	Same as CR1				
CR8	Same as CR1				
CR9	Same as CR1				
CR10	Same as CR1				
CR11	Same as CR5				
Q1	TRANSISTOR, Silicon PNP, 2N3638A	910300037			4
Q2	TRANSISTOR, Silicon NPN, 2N3641	910300044			1
Q3	TRANSISTOR, Silicon, NPN, 40250	910300057	RCA	40250	1
Q4	TRANSISTOR, Silicon, NPN, 2N3565	910300046			4
Q5	Same as Q4				
Q6	Same as Q4				
Q7	Same as Q4				
Q8	Same as Q1				
Q9	Same as Q1				
Q10	Same as Q1				
R1	RESISTOR, Composition, 5.6K $\pm$ 5%, 1/4W	906900562			2
R2	RESISTOR, Composition, 1.8K $\pm$ 5%, 1/4W	906900182			2

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, POWER SUPPLY REGULATORS</u> (Continued)				
R3	RESISTOR, Composition, 3.3 ohms $\pm 5\%$, 1W	905400033	Bourms	224P-1-502	3
R4	RESISTOR, Composition, 12K $\pm 5\%$, 1/4W	906900123			1
R5	POTENTIOMETER, Wirewound, 5K, 25T, PC Mtg.	907900267			2
R6	RESISTOR, Composition, 4.7K $\pm 5\%$, 1/4W	906900472			2
R7	Same as R6				
R8	RESISTOR, Composition, 1K $\pm 5\%$, 1/4W	906900102			2
R9	Same as R8				
R10	RESISTOR, Composition, 3.9K $\pm 5\%$, 1/4W	906900392			3
R11	Same as R10				
R12	Same as R2				
R13	Same as R3				
R14	Same as R1				
R15	Same as R5				
R16	Same as R10				
R17	RESISTOR, Composition, 2.7K $\pm 5\%$, 1/4W	906900272			1
R18	RESISTOR, Composition, 3.3K $\pm 5\%$, 1/4W	906900332			1
R19	Same as R3				
Z1	BRIDGE RECTIFIERS	910800023	IR	10DB2A	2
Z2	Same as Z1				
A8	<u>ASSEMBLY, POWER SUPPLY FILTERS</u>	C02421600	Sierra	C02421600	1
C1	CAPACITOR, Electrolytic, 1100 μ F, 50WVDC	902200118	Sprague	39D118G050HP4	4
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
R1	RESISTOR, Wirewound, 5 Ω 10W, Series 99	906400050	Ohmite	4549	1
R2	RESISTOR, Fixed Composition, 27 Ω $\pm 10\%$, 1W	905600270			1
A9	<u>ASSEMBLY, DC REFERENCE STANDARD</u>	C02424300	Sierra	C02424300	1
CR1	DIODE, Zener, 1N3024	910500027	TRW		1
CR2	DIODE, 1N456	910500031			1
CR3	DIODE, Zener, PS1200	910500074			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, DC REFERENCE STANDARD (Continued)</u>				
K1	RELAY, DPDT	912600056	Winelco	113014	1
R1	RESISTOR, Composition, 62Ω 5%, 2W	905800620			1
R2	RESISTOR, Composition, 91Ω $\pm 5\%$, 2W	905800910			1
R3	RESISTOR, Composition, 820Ω $\pm 5\%$, 1/2W	905000821			1
R4	POTENTIOMETER, Composition, 2K	907900189	AB	Type RP202M	1
R5	POTENTIOMETER, Cermet, 200Ω , 25 Turn	907900277	CTS 6643	185PC201A	1
R6	RESISTOR, WW, 60Ω $\pm 1\%$, 1W	906100038	RCL 7040		1
R7	RESISTOR, WW, 65Ω $\pm 1\%$, 1W	906100137	RCL 7040		1
R8	RESISTOR, Precision, $.6531\Omega$, .05%, 1/2W WW	906100134	RCL 7020		1
R9	RESISTOR, Precision, 1.5935Ω , .05%, 1/2W WW	906100135	RCL 7020		1
R10	RESISTOR, Precision, 14.000Ω , .05%, 1/2W WW	906100136	RCL 7020		1
R11	RESISTOR, Precision, 196.5Ω , 1%, 1/2W WW	906100128			1
R12	RESISTOR, Composition, 330Ω $\pm 5\%$, 1W	905400331			1
A10	<u>ASSEMBLY, RELAY</u>	802422400	Sierra	802422400	1
K1	RELAY, SPDT	912600030	Winelco	DC-1C-24M	1
K2	RELAY, DPDT	912600052	Winelco	101057101	2
K3	Same as K2				
R1	RESISTOR, Composition, 120Ω $\pm 5\%$, 2W	905800121			2
R2	Same as R1				
A11	<u>SUB ASSEMBLY, IMPEDANCE SELECTOR</u>	C02425000	Sierra	C02425000	1
J14	RF CONNECTOR	914600107			4
J15	Same as J14				
J16	Same as J14				
J17	Same as J14				
J18	DOUBLE JACK	914600110			1
P13	CABLE ASSEMBLY	B02472001			1
P19	CABLE ASSEMBLY	B02472002			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>ASSEMBLY, IMP. MATCHING SUB ASSEMBLY</u> (Continued)				
S1	SWITCH, Rotary	911200140	Sierra	A02422100	1
A11-1	<u>ASSEMBLY, IMPEDANCE TRANSFORMER</u>	B02423900	Sierra	B02423900	1
R1	RESISTOR, Precision, Metal Film, $16.9\Omega \pm 1\%$, 1/2W	908300068			2
R2	RESISTOR, Precision, Metal Film, $158\Omega \pm 1\%$, 1/2W	908300069			1
T1	TRANSFORMER, Imp. Match 75 to 135Ω	909800020	Sierra	A02472700	1
A12	<u>ASSEMBLY, ISOLATION AMPLIFIER</u>	B02492800	Sierra	B02492800	1
C1	CAPACITOR, Fixed Cer., 500 pF	901410501			4
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
L1	INDUCTOR, Fixed, .33 μ H	909000129	Nytronics	WEE 33	1
R1	RESISTOR, Fixed Composition, $47\Omega \pm 5\%$, 1/4W	906900470			1
R2	RESISTOR, Fixed Composition, $100K \pm 5\%$, 1/4W	906900104			1
R3	RESISTOR, Fixed Composition, $1K \pm 5\%$, 1/4W	906900102			1
R4	RESISTOR, Fixed Composition, $2.7K \pm 5\%$, 1/4W	906900272			1
R5	RESISTOR, Fixed Composition, $100\Omega \pm 5\%$, 1/4W	906900101			2
R6	RESISTOR, Fixed Composition, $1.5K \pm 5\%$, 1/4W	906900152			1
R7	Same as R5				
R8	RESISTOR, Fixed Composition, $270\Omega \pm 5\%$, 1/2W	905000271			1
R9	RESISTOR, Fixed Composition, $220\Omega \pm 5\%$, 1/2W	905000221			1
Q1	TRANSISTOR, 2N3819	910300069			1
Q2	TRANSISTOR, 2N3563	910300042			1
Q3	TRANSISTOR, 2N3137	910300025			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>CHASSIS</u>	D02473500	Sierra	D02473500	
C1	CAPACITOR, 2.01 μ F, 600V, Ceramic Disc	901450103			1
C2	CAPACITOR, .001, 500V	901400102			5
C3	Same as C2				
C4	CAPACITOR, Feed Thru 1000 pF	902640102			10
C5	Same as C4				
C6	Same as C4				
C7	Same as C4				
C8	Same as C4				
C9	Same as C4				
C10	Same as C4				
C11	Same as C4				
C12	Same as C4				
C13	Same as C4				
C14	Used on Rear Panel				
C15	Same as C14				
C16	Same as C14				
C17	Same as C14				
C18	Same as C2				
C19	Same as C2				
C20	Same as C2				
L1	INDUCTOR, 33 μ H	909000129			2
L2	Same as L1				
T1	TRANSFORMER, Power	910000098			1
T2	TRANSFORMER, Power	910000102			1
	ATTENUATOR, 10 dB Step	912100012	Sierra	A02413800	1
	ATTENUATOR, 1 dB Step	912100011	Sierra	A02413900	1
	<u>FRONT PANEL ASSEMBLY</u>	D02474000	Sierra	D02474000	
DS1	Part of M1 (Lampe 5V, 2.86A)	913800034	G.E.	No. 6	1
DS2	DISPLAY, Attenuator	919900024			1
M1	METER	911800108			1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	<u>FRONT PANEL ASSEMBLY</u> (Continued)				
R1	POTENTIOMETER, 2K $\pm 5\%$, Wirewound	907900148			1
R2	POTENTIOMETER, 10K $\pm 5\%$, Carbon	907900264			1
R3	POTENTIOMETER, 100 Ω $\pm 5\%$, "Palirium"	907900268	Bourns	30535-1-101	1
S1	SWITCH (OFF-ON) Red-Green	911300015	Sierra	A02652202	1
S2	SWITCH (0 ± 1) Red-Red	911300016	Sierra	A02652203	1
S3	SWITCH (ON-OFF) Red-Green	911300019	Sierra	A02652201	1
S4	SWITCH, Rotary	911200139		A02420000	2
S5	Same as S4				
	A10 RELAY BOARD, P.C.	B02422300	Sierra	B02422300	1
A12	<u>REAR PANEL ASSEMBLY</u>	C02473400	Sierra	C02473400	1
C14	CAPACITOR, Feed Thru	902640102			1
C15	CAPACITOR, Fixed, .01 μ F	901420103			3
C16	Same as C15				
C17	Same as C15				
	A12 ISOLATION AMP - P.C. BOARD	B02492800	Sierra	B02492800	1
F1	FUSE, .5A, SLO-BLO	913200011	Littelfuse		2
F2	Same as F1				
J1	CABLE ASSEMBLY	B02471700	Sierra	B02471700	1
J2	CONNECTOR	914600074	Amphenol	UG-657/U	1
J19	Part of J20				
J20	CONNECTOR, RF Coax.	914600108			1
J21	JACK, Red	915200008	Superior		1
J22	JACK, Black	915200009	Superior		1
J26	CONNECTOR	914600099	Amp	329852	1
P23	CABLE ASSEMBLY	B02472400	Sierra	B02472400	1
	CABLE ASSEMBLY	B02471802	Sierra	B02471802	1
P26	CABLE ASSEMBLY	B02471903	Sierra	B02471903	1

TEST PROBES, MODEL 305A-P

I. FORWARD

This book discusses and describes two test probes that may be used with the Model 305A Transmission Measuring Set. These test probes may also be used with other equipment. (See Figure 1-1)

II. ACTIVE COAXIAL PROBE

Model 305A-P/AC Active Probe (See Figure 1-1) is used to monitor low-level signals between 10 kHz and 33.5 MHz. This probe features a 0 dB insertion loss when either bridging or terminating a 50 ohm or a 75 ohm line. This probe is a hand held unit mounting two thumbwheel switches. Four feet of 75 ohm coaxial cable conducts the monitored signal to the level meter. Any of the five heads illustrated in Figure 1-2 may be used with this probe. The heads slide onto the body and detent into place.

The probe has the following specifications:

Insertion Loss		0 dB
Input Mode		50 or 75 Ω
Input Function		Bridging or Terminating
Band Pass		1 kHz to 33 MHz
Band-Pass Deviation		≤ 0.2 dB from 1 kHz to 22 MHz ≤ 0.5 dB from 22 MHz to 32 MHz
Input Impedance		10K Ω in the Bridging Function
Input Capacitance		10 pF
Output Impedance		75 Ω
Distortion (Harmonic)		50 dB
		NB 0.3 dB
Noise		WB 4.0 dB
Maximum Signal		+10 dBm

The body mounts two thumbwheel switches. BRIDGING-TERMINATING is the forward switch. This switch applies or removes a 50 or a 75-ohm input termination to ground.

To operate the probe, calibrate the level meter then connect the probe plug into INPUT and POWER jacks of the level meter. Attach the desired head, and operate the switches to the desired position. The level meter will then indicate the level of the monitored signal directly.

Field effect Transistor Q1 sends the signal through emitter-follower Q2. The attenuation of Q2, when the Switch S2 is in the 75 Ω position, is 1.8 times the

TEST PROBES, MODEL 305A-P

attenuation when Switch S2 is in the 50Ω position. Emitter follower Q2 sends the signal through the level-adjusting Potentiometer R8 and through two stages of amplification, Q3 and Q4. Transistor Q4 sends a degenerative feedback through Resistor R11 to the base of Q3 for frequency stability. Emitter-followers Q5 and Q6 send the signal through output terminating Resistor R17 to the level meter. See Figure 1-3 for the schematic diagram.

To checkout the probe, calibrate the level meter, then operate SELECTIVITY Switch to the NARROW condition and set SENSITIVITY Switch to the NORM Position. Connect the input of the level meter to the output of the signal generator with a 50-ohm coaxial cable. Adjust the signal generator for 0 dBm, and successively tune the tuning unit to 10 kHz, 100 kHz, 1 MHz, 5 MHz, 15 MHz, 22 MHz, 25 MHz and 33.5 MHz. Note the meter reading at each frequency. Replace the coaxial cable with the probe bearing the 50-ohm head, and read the DECIBELS meter at the above frequencies. The meter readings shall not deviate more than ± 0.2 dB from the recorded reading between 10 kHz and 22 MHz. The deviation shall not exceed ± 0.5 dB from 22 MHz to 33.5 MHz.

To align the probe, tune the signal generator for 0 dBm at 1 MHz, calibrate the level meter, then connect the output of the signal generator to the input of the level meter with the probe bearing the 50-ohm head. Adjust potentiometer for a 0 dB indication on the DECIBELS Meter. Vary the frequency as above, and adjust capacitor C6 for a within tolerance reading.

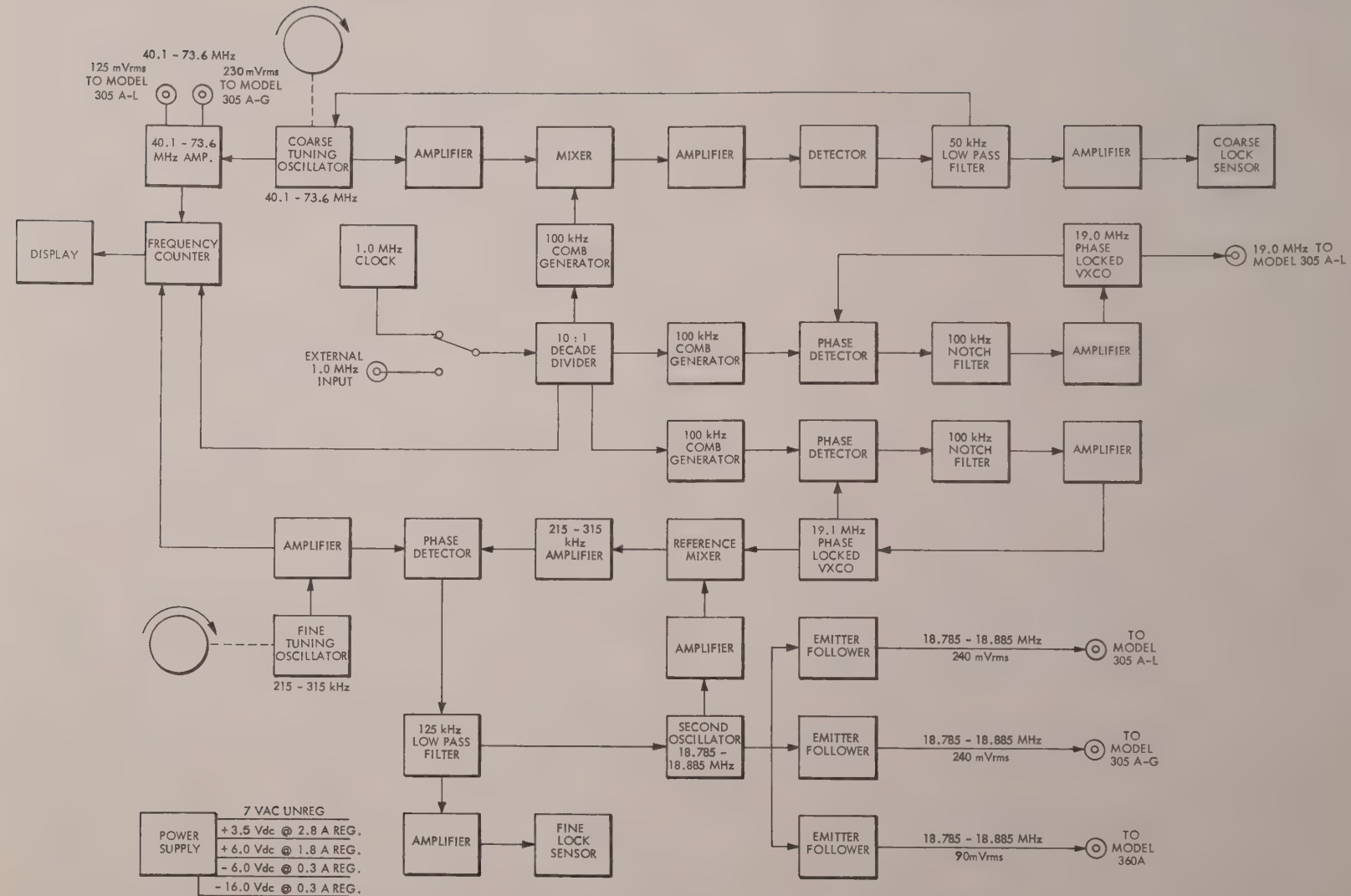


Figure 6-1. Model 305A-T Tuning Unit, Block Diagram

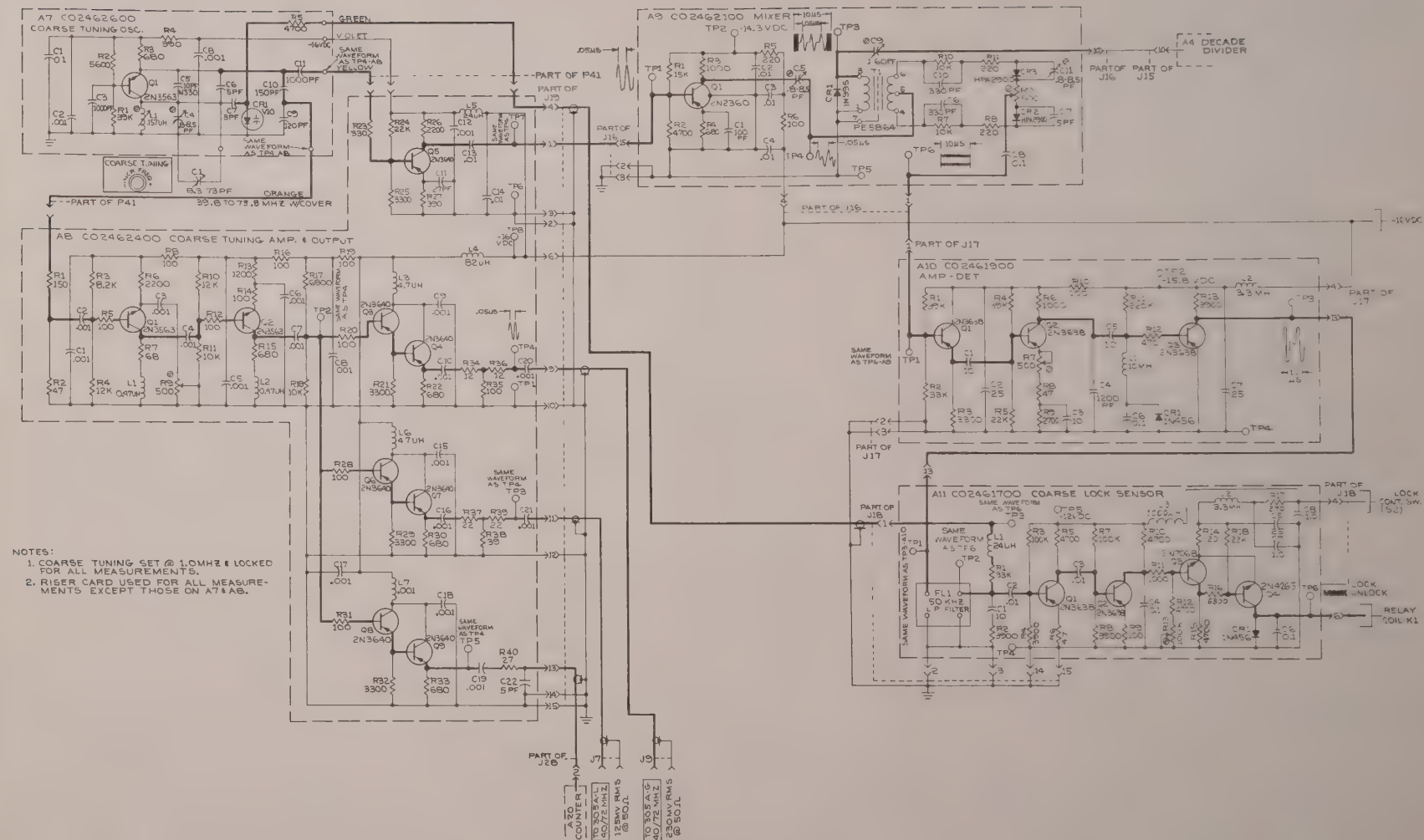


Figure 6-2. Coarse Tuning Oscillator, Schematic Diagram

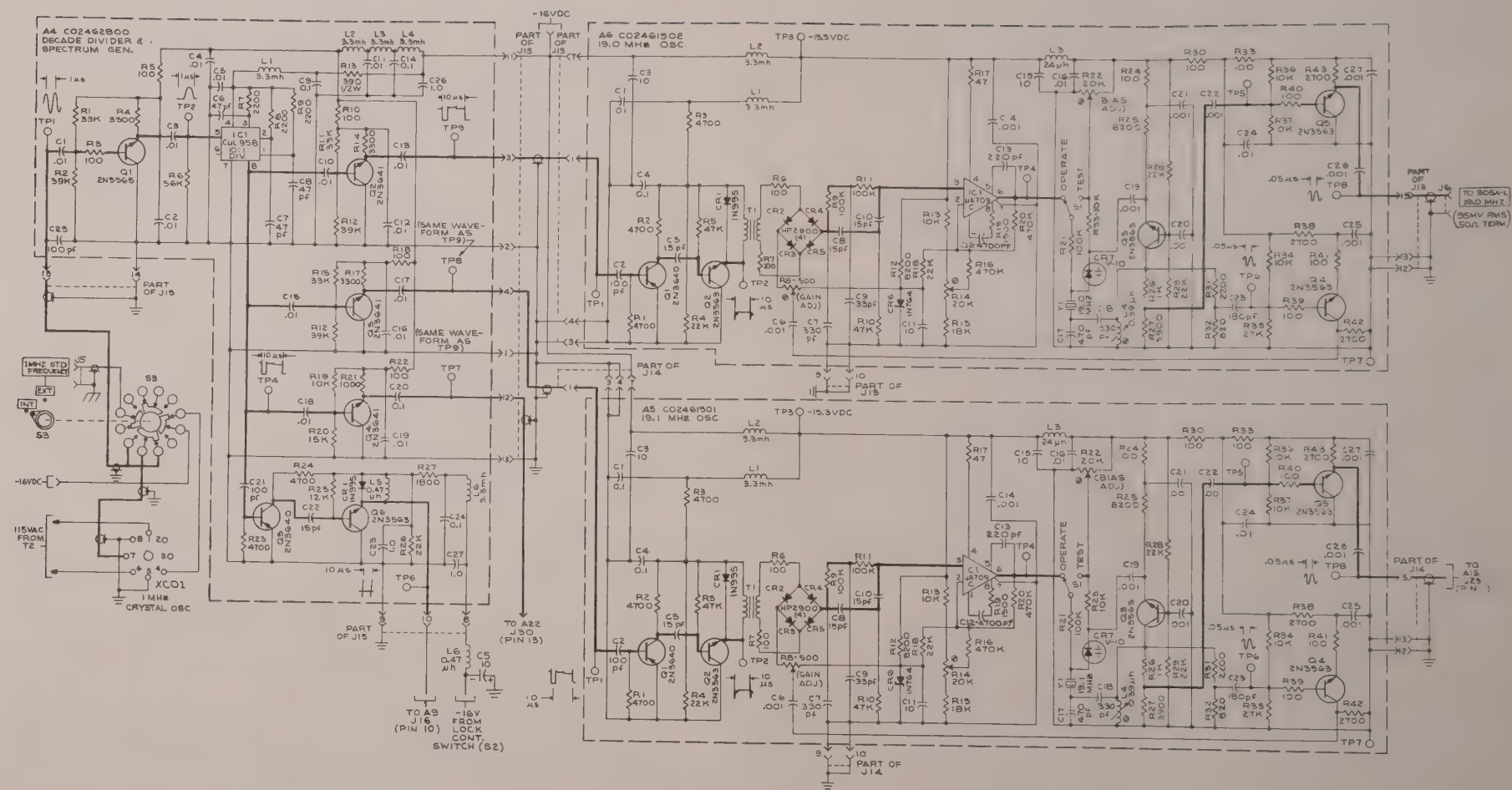


Figure 6-2A. Frequency Synthesizer

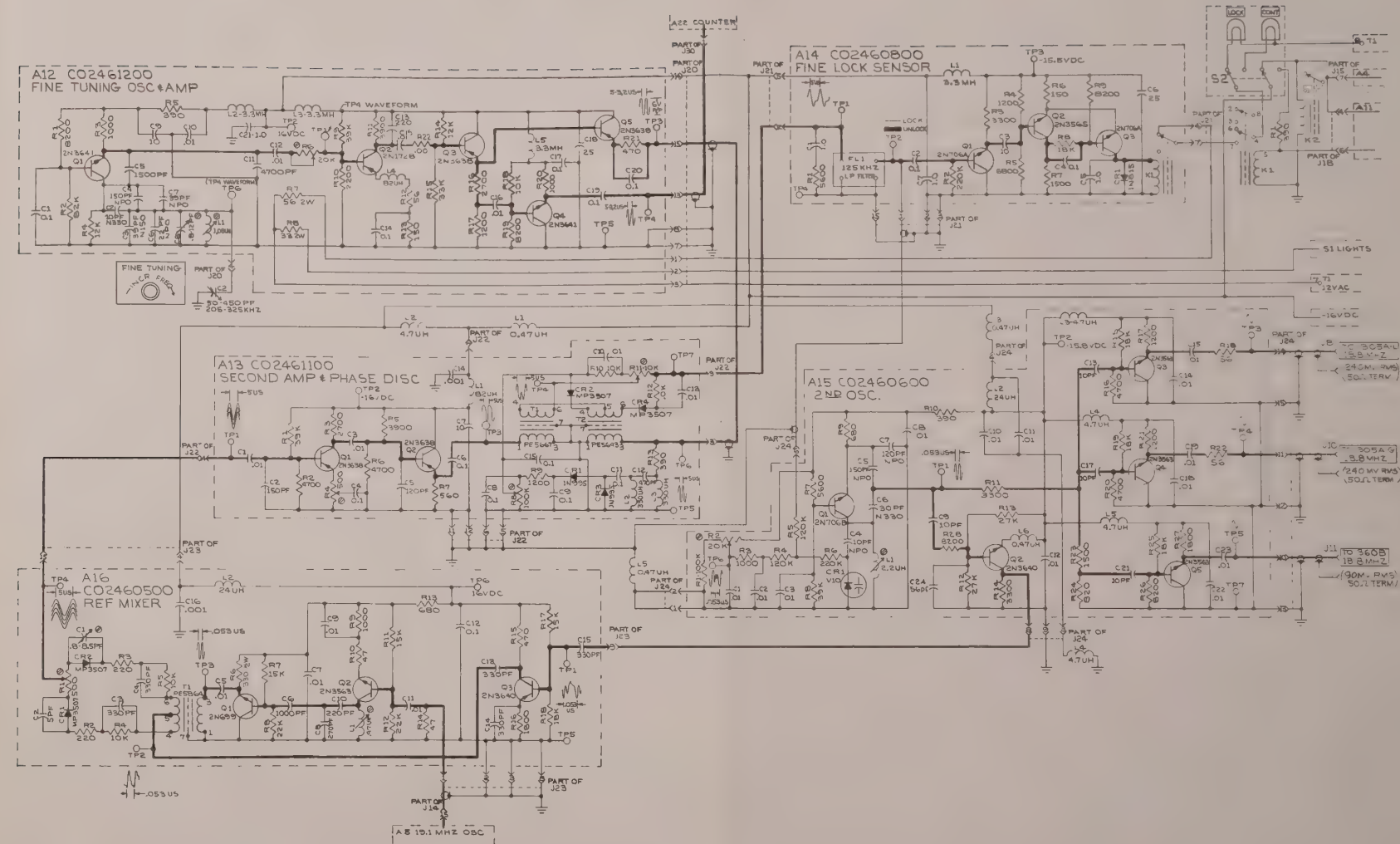
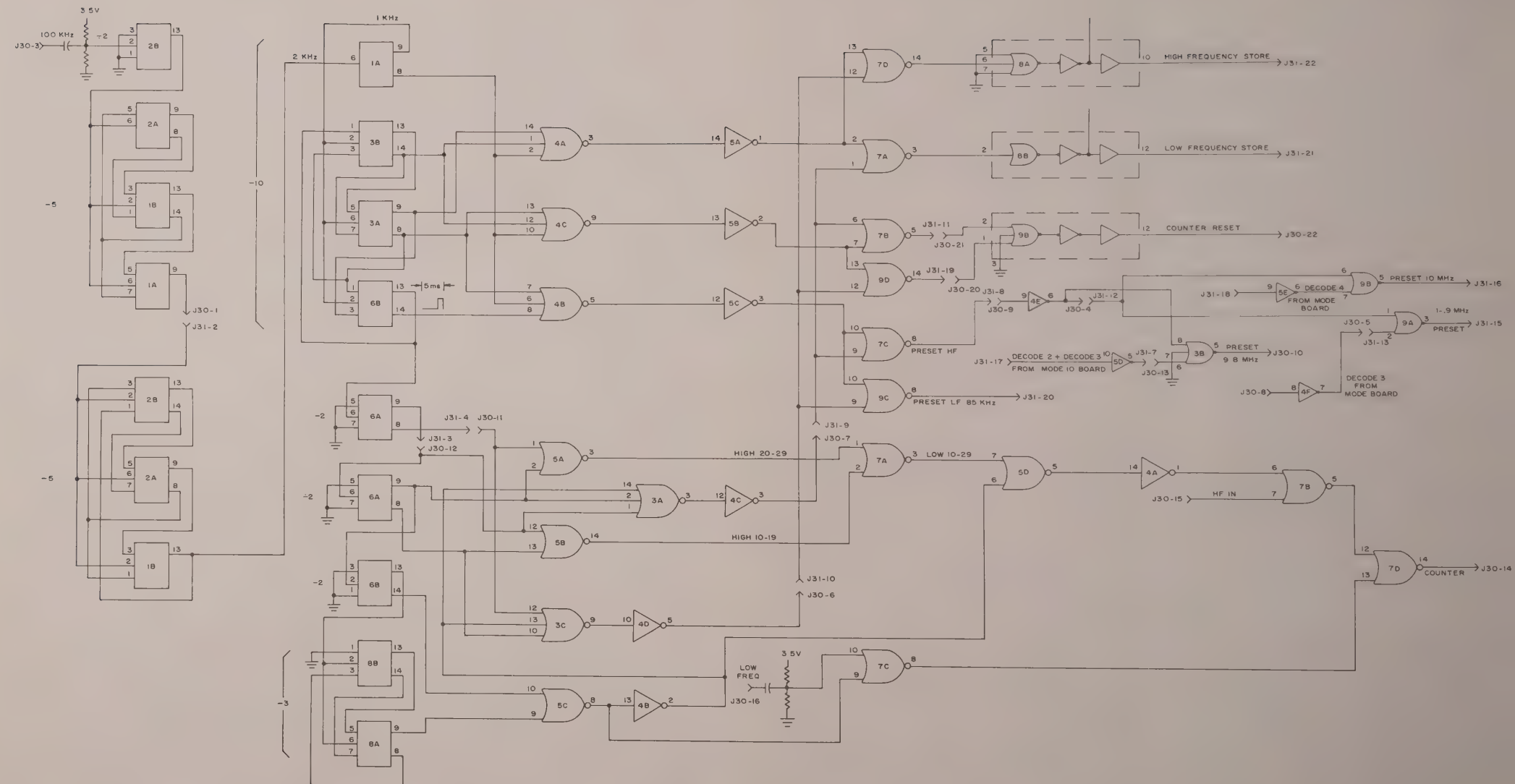


Figure 6-3. Fine Tuning Oscillator, Schematic Diagram





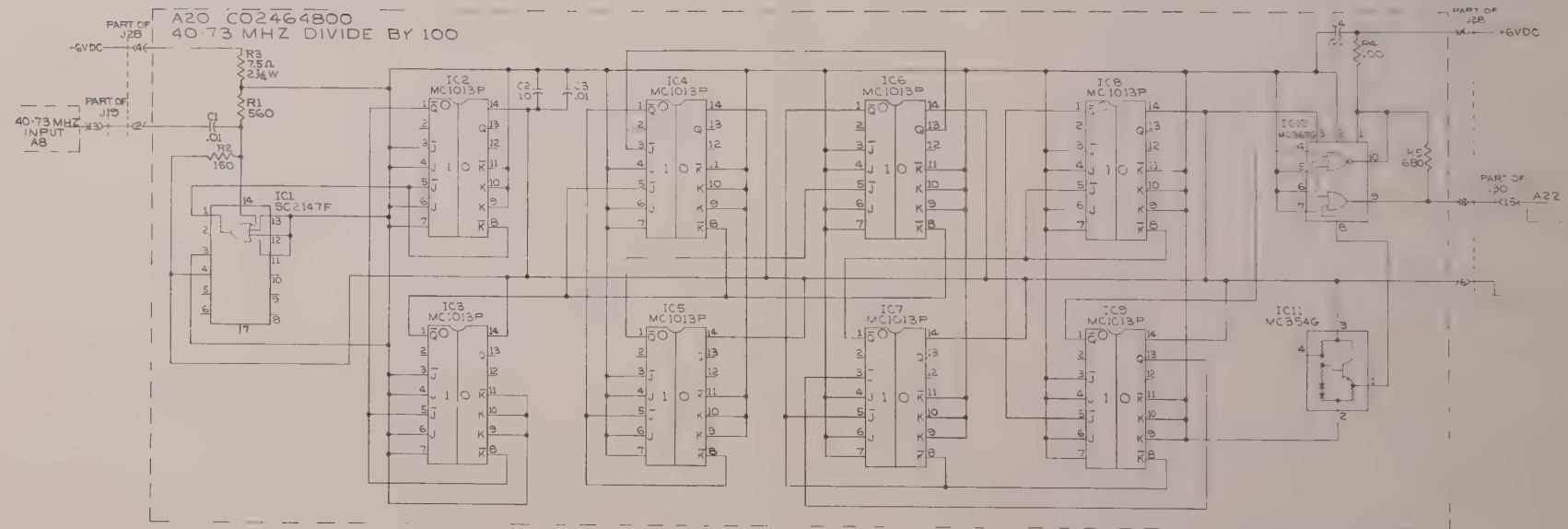


Figure 6-5A. Centinary Divider Schematic Diagram





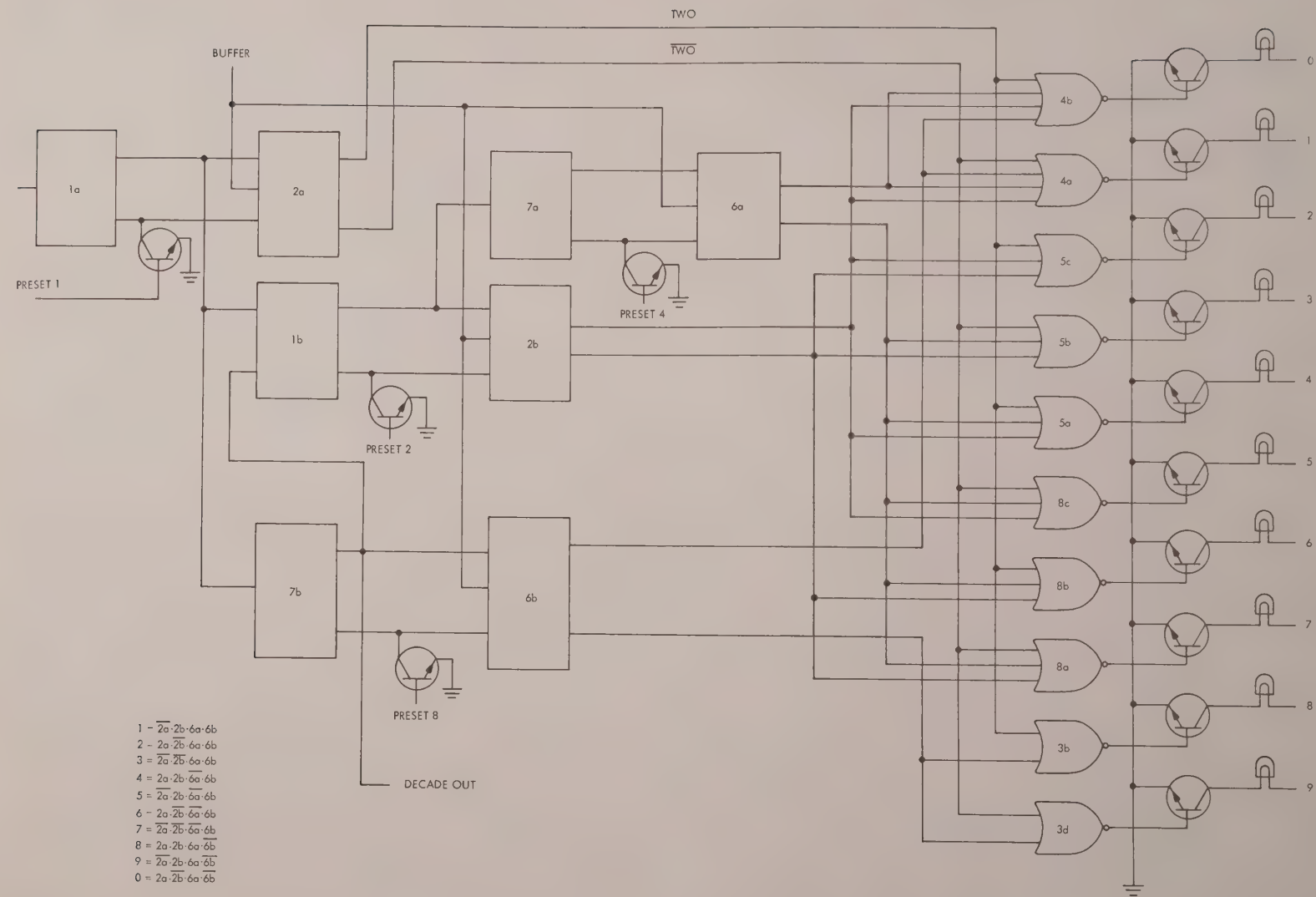


Figure 6-8. Decade Logic Diagram

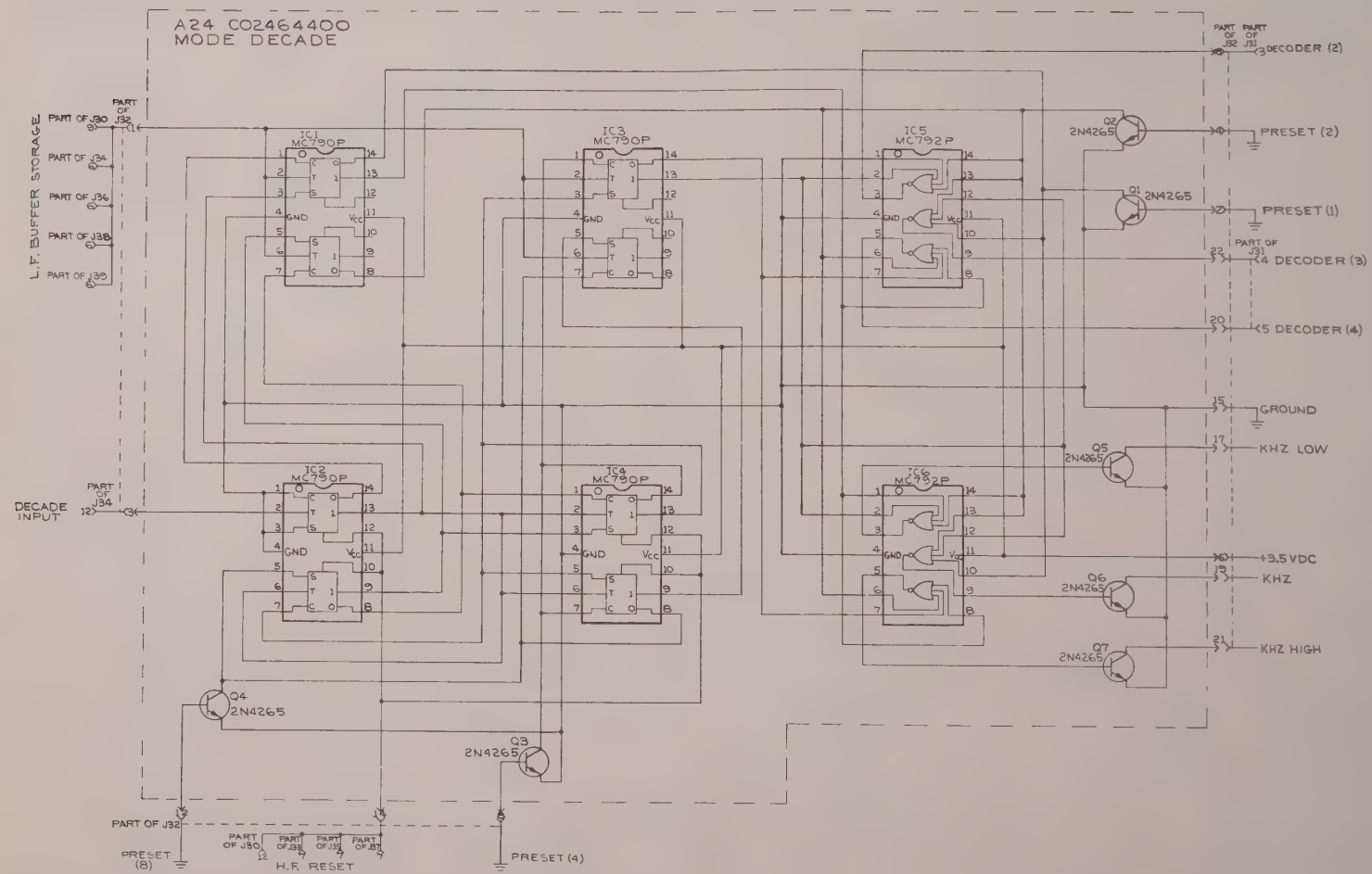


Figure 6-9. Mode Decade, Schematic Diagram



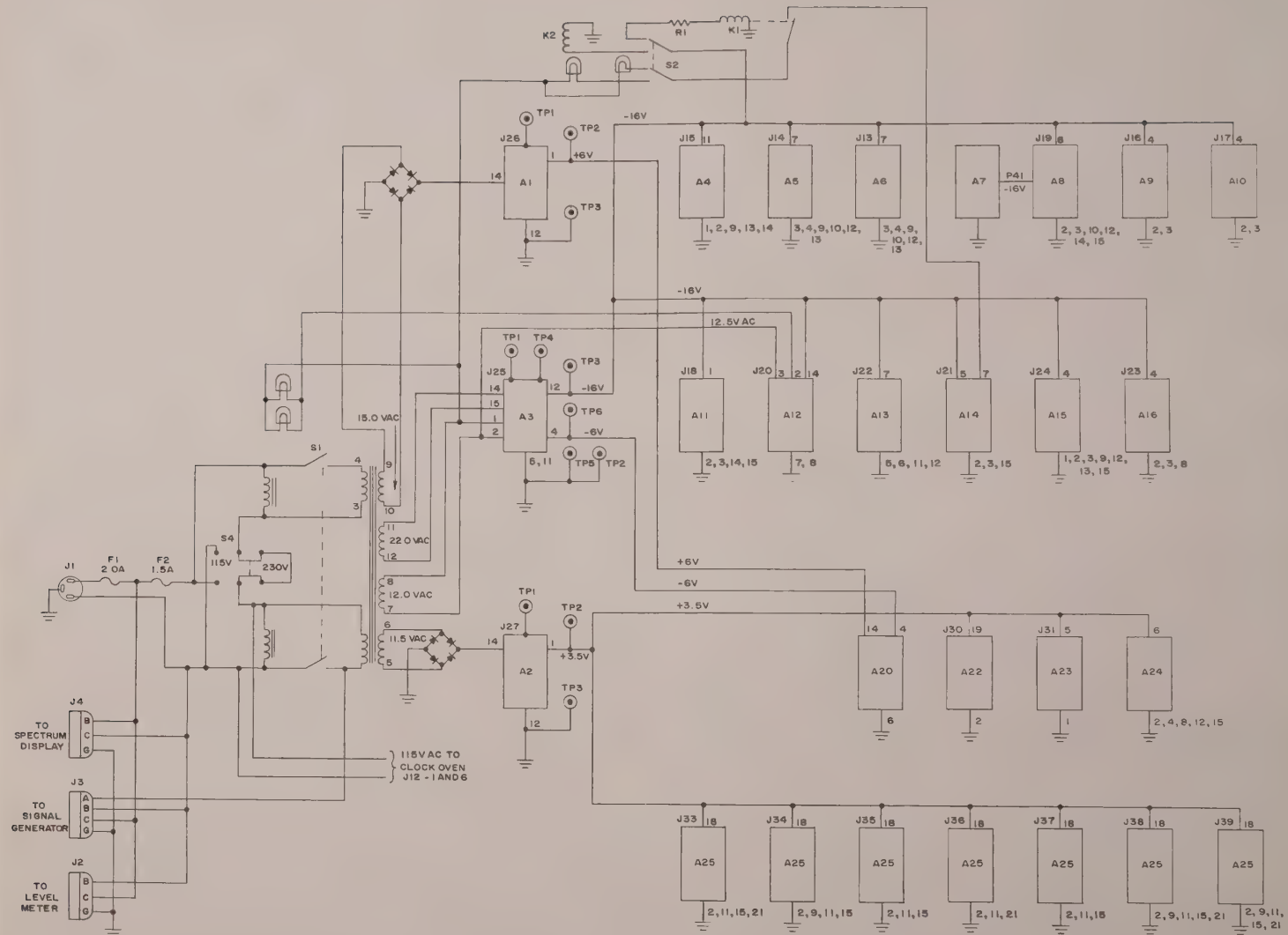


Figure 6-11. Tuning Unit Power Distribution Diagram

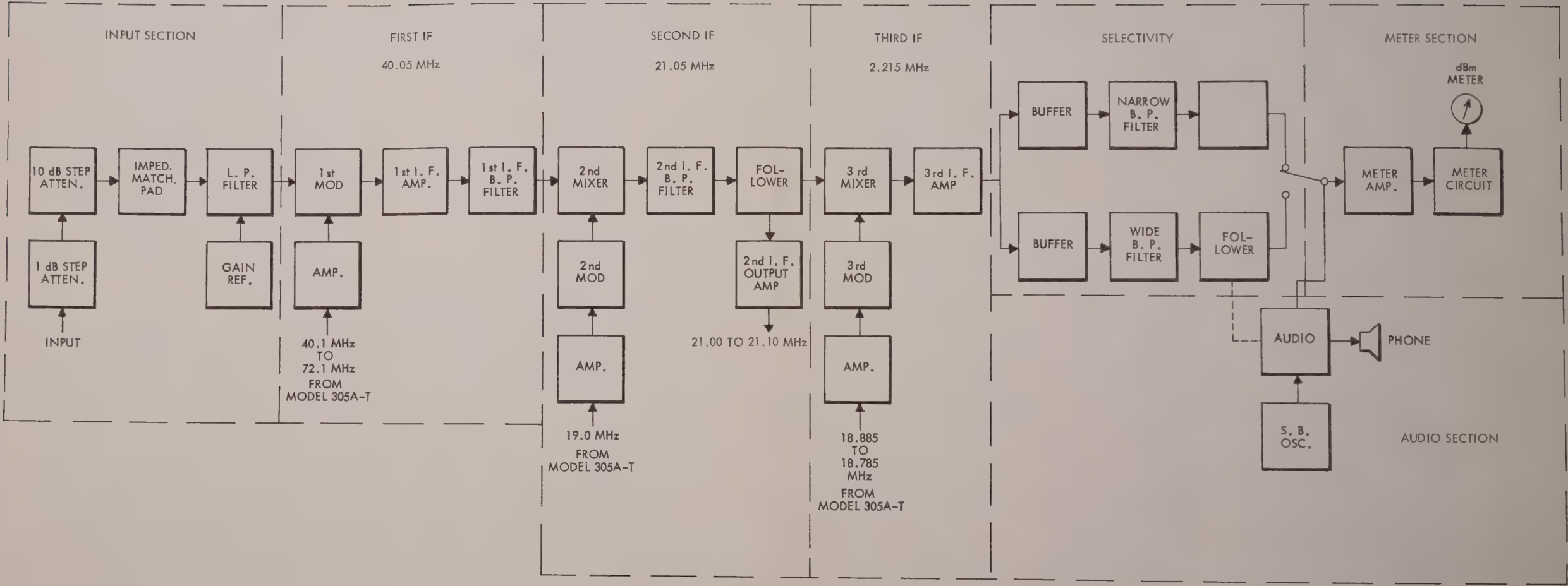


Figure 6-12. Frequency Selective Level Meter, Block Diagram

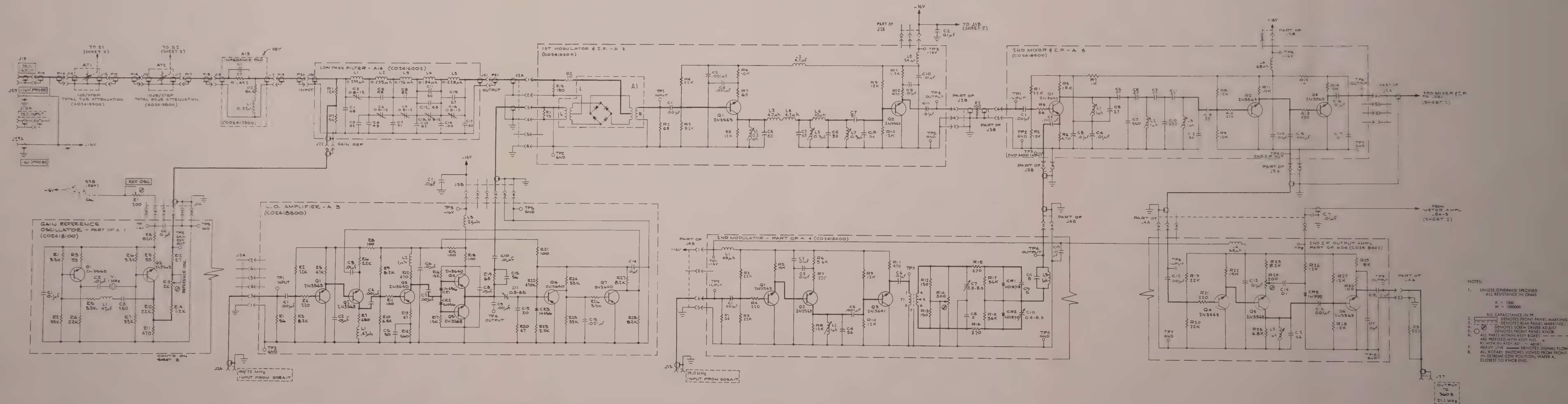


Figure 6-13. Frequency Selective Level Meter, Schematic Diagram

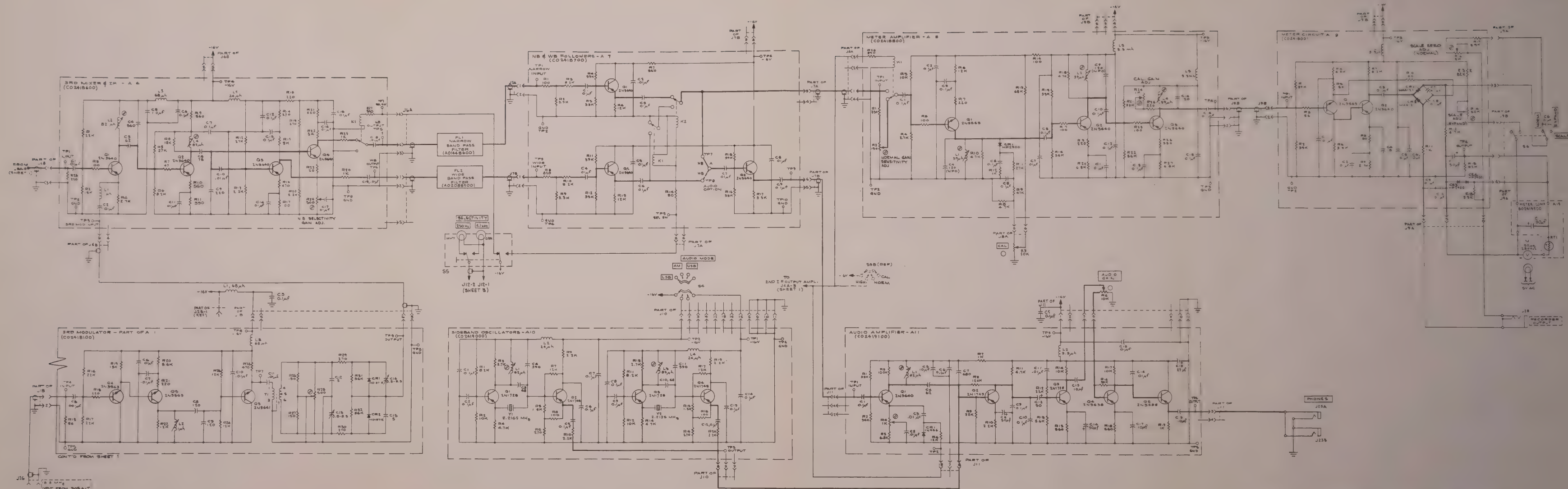


Figure 6-14. Frequency Selective Level Meter, Schematic Diagram

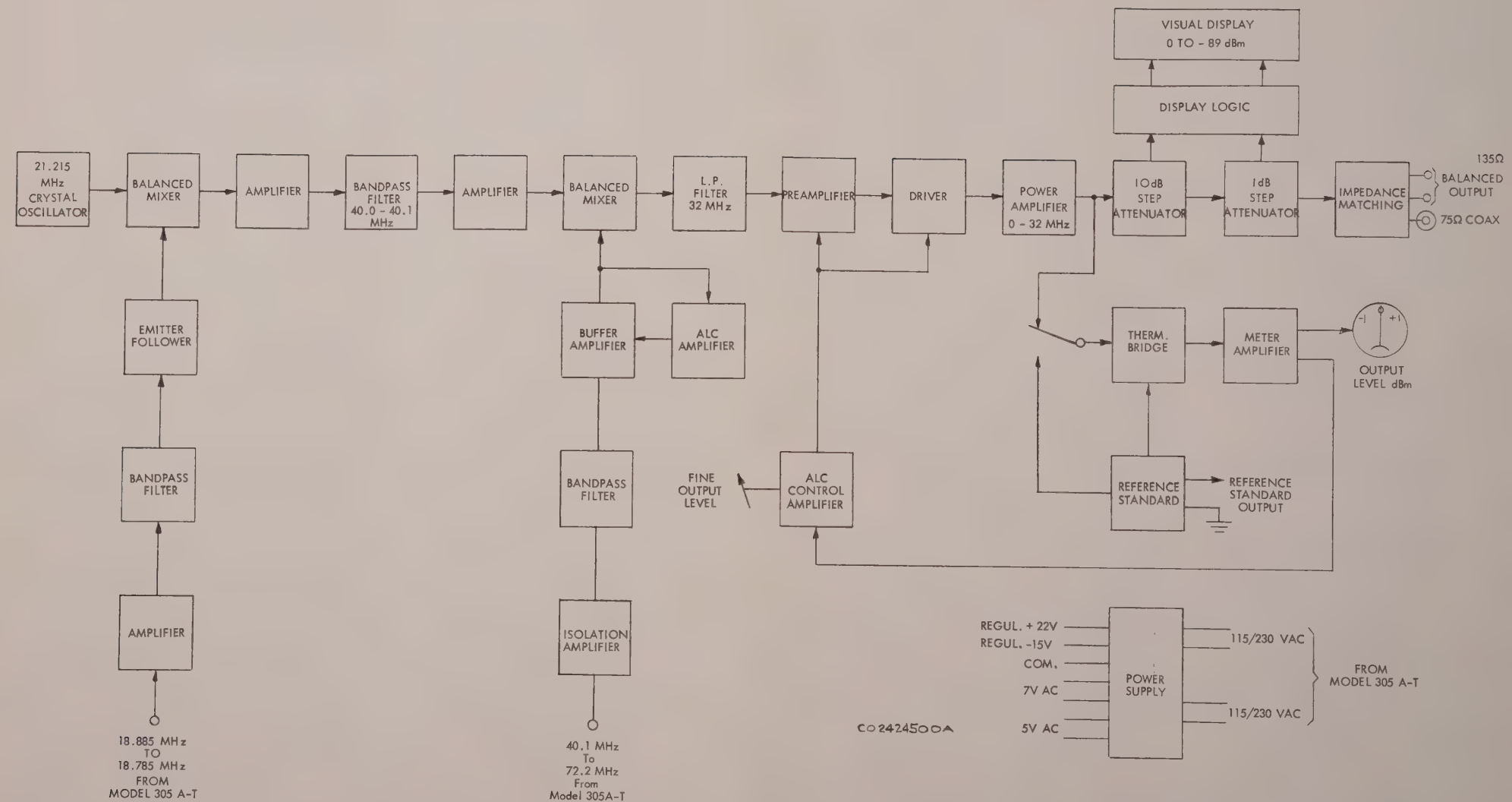


Figure 6-15. Tunable Signal Generator, Block Diagram

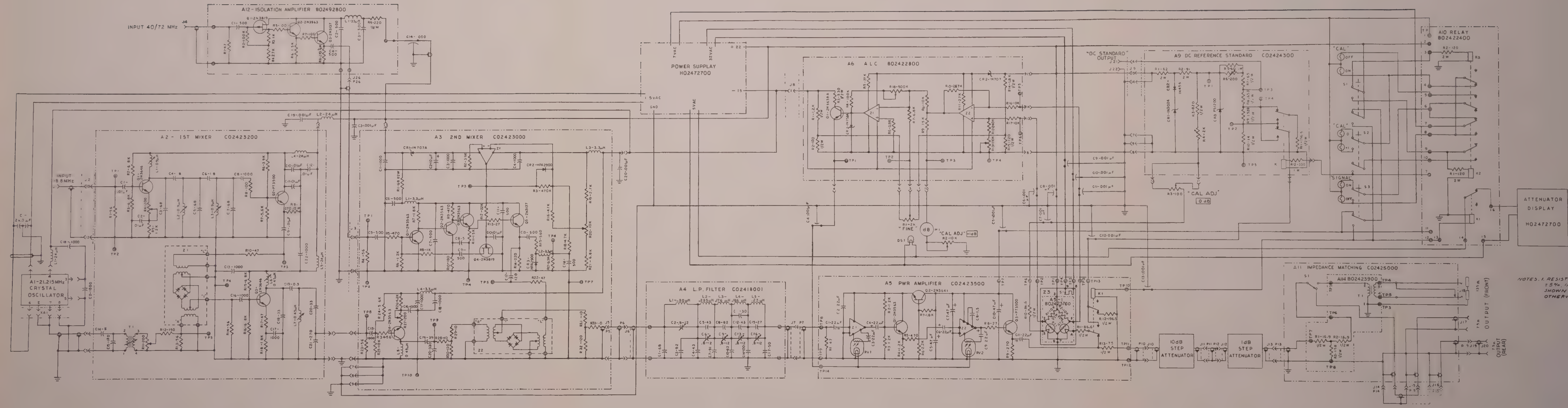


Figure 6-16. Tunable Signal Generator, Schematic Diagram

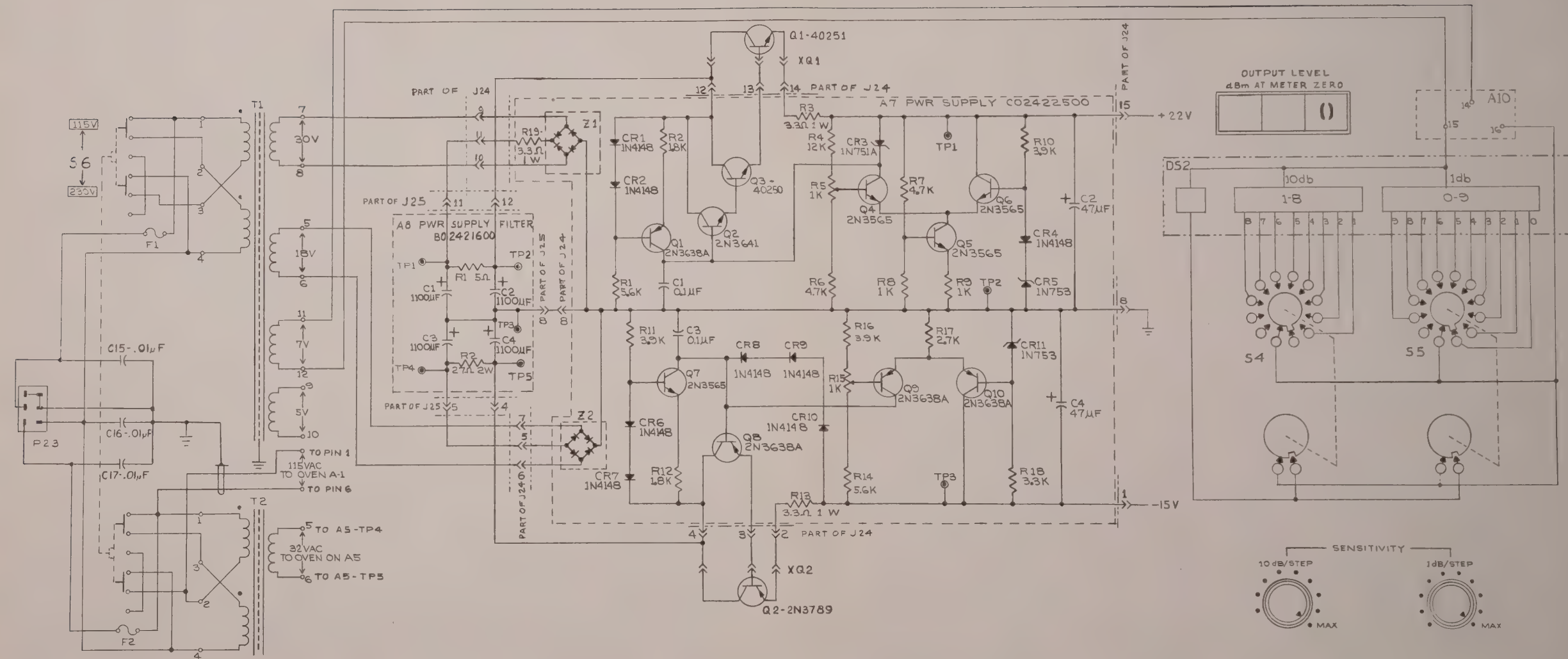


Figure 6-17. Tunable Signal Generator, Schematic Diagram

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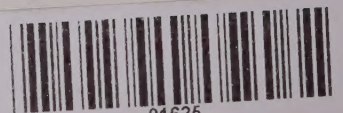
Warranty

SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION warrants instruments manufactured by it and bearing Sierra commercial model numbers, except Ion Gauge Tubes, to be free from defective material and factory workmanship and agrees to repair such instruments, which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any such instrument which in our sole opinion upon our examination proves to be so defective, when returned to our factory, transportation prepaid by the purchaser, within one year from the date of original purchase from us.

This warranty does not apply to any of our products which have been repaired, worked upon or altered by persons not authorized by us so as, in our sole judgment, to injure the stability or reliability of such instrument, or which have been subject to misuse, negligence or accident, or the serial number of which has been altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, used or adjusted otherwise than in accordance with the instructions furnished by us. Nor does SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION assume any liability for consequential damages, and in any event our liability shall in no case exceed the original purchase price of the instrument. Accessories, including but not limited to all vacuum tubes, fuses and batteries, not of our manufacture used with this product are not covered by this warranty.

SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION reserves the right to make changes in the design or construction of any of its instruments at any time without incurring any obligation to make any changes whatever on units previously purchased.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to represent nor assume for us any liability in connection with the sale of our products other than set forth herein.



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